H.R. 4932—TO AMEND LAND REMOTE SENSING COMMERCIALIZATION

HEARING

BEFORE THE

SUBCOMMITTEE ON
SPACE SCIENCE AND APPLICATIONS

OF THE

COMMITTEE ON
SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

NINETY-NINTH CONGRESS

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H.R. 4932, TO AMEND LAND REMOTE SENSING COMMERCIALIZATION

FRIDAY, JULY 18, 1986

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS,
Washington, DC.

The subcommittee met, pursuant to call, at 9:50 a.m., in Room 2325, Rayburn House Office Building, Hon. Bill Nelson (chairman of the subcommittee) presiding.

Mr. NELSON. Good morning.

We appreciate your patience. We are delighted to have you today and we are opening hearings on technical amendments to the Land Remote Sensing Act.

Two years ago, this committee took a major step forward in initiating legislation that would set the stage for private enterprise to enter into commercial space activities.

In the areas such as remote sensing, those which indeed have been traditionally Government activities, this committee recognized that it would be a challenge to both the Government and to the private sector in this new kind of relationship and thus in a sense we viewed this as an experiment.

Well, unfortunately the outcome of this experiment is not yet evident. Suffice it to say that thus far all has not gone well. We have seen the administration take a step forward and two steps backward in its commitment to fund this designated private sector operator.

We have seen indecision of the same type most recently in trying to figure out what to do with regard to the replacement of an orbiter. And all along, meanwhile, the foreign competition in the private sector grows stronger.

Well, while the subject of this hearing, this legislation, these technical amendments certainly cannot address all of these problems, this legislation which was introduced in June, does provide a practical remedy to some of the difficulties that have arisen.

Among the major provisions of this bill, it will make it easier for private sector operators and the Government to exchange data for research and development. We recognize that R&D can be a major stimulus to market development. We also propose the establishment of a National Advisory Committee to provide a forum for the various entities involved in remote sensing and to provide advice to the Federal agencies responsible for the remote sensing R&D.

We have several other provisions designed to optimize our designated entity's chance for success while retaining the competitive environment in order to have what we think would be operational efficiency.

So today we are going to take testimony from those in the private sector and from Government who have the insight into how these technical amendments will affect the outlook for remote sensing.

We will hear from Mr. Chuck Williams, President of Eosat, our designated operator for Landsat. Dr. Fred Henderson of Geosat will tell us how some remote sensing users may react to these amendments.

Finally, we will hear from Dr. Shelby Tilford of NASA and Dr. Bill Bishop of NOAA. Dr. Tony Calio was called out of the country last night. So, welcome.

Mr. Walker.

Mr. WALKER. Thank you, Mr. Chairman.

I join you in welcoming the witnesses here this morning. I have no prepared statement for the opening.

Mr. NELSON. All right. Let's proceed.

Mr. Williams.

STATEMENT OF C.P. WILLIAMS, PRESIDENT AND CHIEF OPERATING OFFICER, EARTH OBSERVATION SATELLITE CO.

Mr. WILLIAMS. Thank you, Mr. Chairman and members of the subcommittee.

I appreciate the opportunity to appear this morning before the subcommittee and express Eosat's position and support of H.R. 4932.

I have submitted a short statement for the record and would like to make a few supporting comments. Eosat strongly endorses the proposed amendments to Public Law 98-365.

We urge the subcommittee to give prompt attention to those amendments, but the subcommittee may want to give additional consideration to the modifications proposed for section 502.

We believe that the experimental and R&D data from the federally funded programs and experiments often have a great deal of value both to the research and to the commercial communities.

We believe that a much more cost-effective and timely means can be established to make research data available to a wide variety of small users and value-added services.

With respect to section 501, the Advisory Committee for Research and Development, we strongly endorse the need for a representative body from Government, industry, and academia to maintain the correct focus on remote sensing issues relative to satellite remote sensing in the United States and throughout the world.

But there are a number of issues that we feel this body could properly focus on and provide a means to provide long-range policy to the U.S. Government and to industry relative to both domestic issues again and international issues.

Nondiscriminatory access, open sky policy, U.N. initiatives are three areas of primary interest to the United States and to the international community.

We believe that the overall thrust of the amendment is timely and a necessary requirement to effectively and successfully implement 98-365.

Thank you, Mr. Chairman. I don't believe I have any other verbal comments this morning.

[The prepared statement of Mr. Williams follows:]

TESTIMONY OF

MR. C. P. WILLIAMS

PRESIDENT AND CHIEF OPERATING OFFICER

OF

EARTH OBSERVATION SATELLITE COMPANY

BEFORE THE

SUBCOMMITTEE ON SPACE, SCIENCE, AND APPLICATIONS

COMMITTEE ON SCIENCE AND TECHNOLOGY

U.S. HOUSE OF REPRESENTATIVES

18 JULY 1986

Thank you Mr. Chairman and Members of the Subcommittee.

I appreciate the opportunity to appear before the Subcommittee this morning, to express EOSAT's position and support of H.R. 4932, Amendments to the Land Remote-Sensing Commercialization Act of 1984. We believe that H.R. 4932 will contribute substantially toward the successful completion of the commercialization process that began two years ago, with the enactment of the Land Remote Sensing Commercialization Act of 1984 (P.L. 98-365). We urge the Subcommittee to give prompt and favorable consideration to this bill.

STATUS OF EOSAT COMMERCIALIZATION EFFORT

On September 27, 1985, pursuant to authority of Titles II and III of P.L. 98-365, EOSAT entered into a contract with the Department of Commerce to operate the existing Landsat System to market the data generated by the Landsat System, and to design, develop, deploy and operate a new generation of Land Remote Sensing Satellites. In less than ten months since execution of the contract, EOSAT has grown from a nucleus consisting of a handful of key personnel to its present team of more than 100, and has entered into subcontracts for the design and construction of the satellites, sensors and supporting ground system. EOSAT has established international headquarters in Lanham, Maryland, and has initiated sales, administrative and technical support to the domestic and international markets, including 15 foreign ground stations. Including subcontractor personnel, more than 500 people are working toward the successful implementation of the Congressional objective of commercializing land remote sensing. We are pleased to report to this Subcommittee, therefore, that substantial progress has been made toward the achievement of this objective.

We would also like to commend the efforts of NOAA, NASA and U.S.G.S. personnel during this transition process.

SPECIFIC COMMENTS ON PROPOSED AMENDMENTS

At the same time EOSAT firmly believes that an essential condition for the ultimate success of the commercialization process is the expansion of existing applications technology and development of new applications for Landsat data. One of the fundamental premises underlying the 1984 Act (P.L. 98-365) is that the private sector is best suited to the expansion of the data market. EOSAT is convinced of the validity of this premise, and we are therefore pleased to note the Subcommittee's reaffirmation of its strong commitment to the principles set forth in the Act.

In this regard, it is also important to appreciate that the advancement of applications technology will certainly require a substantial investment by both the public and private sectors in research and development programs. It is necessary in our view that the Federal Government continue to encourage and facilitate such research and development activities as directed under Title V of P.L. 98-365. We strongly support the addition of new Section 504 and accompanying modification to Section 202(a)(4) of the Act, authorizing data grants by a system operator for research and development programs. The new section will resolve existing doubts about implementation and establish a framework which we believe will enable the research community, academia, private industry and Government to provide essential assistance to the development of new programs and applications for Landsat data.

EOSAT is particularly pleased to recommend support of the Section 501 modifications, calling for a National Remote-Sensing Advisory Committee. We believe that it is mandatory within the United States to establish a

'body' of representatives from the public and private sector who can maintain the proper focus on issues regarding remote sensing from satellites; and help formulate national policy which will allow the U.S. to stay in the forefront of technology and continue to play a major role in the creation of world-wide policy in the peaceful use of outer space.

I believe that the thrust of Section 502 modifications is warranted but may require additional consideration due to the high cost of Government data distribution and the nature of the competition arising from foreign systems which are nationally subsidized. EOSAT believes that data from Federal experimental and R&D programs often have value to the 'research' and 'commercial' communities. EOSAT can provide a cost-effective means to market and distribute these data on a world-wide basis to large and small users alike.

H.R. 4932 also makes other amendments to the Act, all of which are intended to improve in one way or another the framework that was established in 1984. EOSAT strongly supports the objectives of this legislation. We believe that it will go a long way toward the successful implementation of the commercialization process.

This completes my prepared remarks, Mr. Chairman. I would be pleased to answer any questions which you or the members of the Subcommittee may have.

Mr. NELSON. Thank you.
Dr. Henderson.

STATEMENT OF DR. FREDERICK BRADLEY HENDERSON III, PRESIDENT, THE GEOSAT COMMITTEE, INC., SAN FRANCISCO, CA

Dr. HENDERSON. Thank you, Mr. Chairman.

I am pleased to have the opportunity to appear before your subcommittee in support of the proposed amendments before us, in particular whereas they serve to better define the relationships of the working mechanism between the involved Federal agencies and the private sector.

The Geosat Committee believes that the Landsat Act of 1984 is fundamentally a very good law and we support its goals and the purpose of transferring the Landsat and land remote sensing technologies to the private sector.

However, to be successful, we believe that this transfer must involve a strong and well-established working relationship between all involved Government and private sector interests.

While we support the amendments in general, I would like to offer a few comments. The Geosat Committee—with regard to establishment of a national remote sensing advisory committee, the Geosat Committee strongly believes that the orderly continued technological development of U.S. land and ocean remote sensing satellite capabilities will depend upon the establishment of strong, cooperative, international, active mechanisms for decisionmaking and shared responsibilities for both the Government and private sector with respect to planning for and funding of future basic science, research and applications in technology development necessary for the continuity of civilian, Government and/or commercial private sector systems in the United States.

We have testified before the Senate in November and also before the National Commission on Space reflecting our concerns about the establishment of an ongoing Government-private sector forum involving all interested parties.

As a major step toward these recommendations, and I have included those statements for the record, if I may, the Geosat Committee strongly supports the establishment of a national remote-sensing advisory committee as a strong step toward such a forum.

I would like to comment on the amendments.

Under section 501, specifically regarding membership, we would like to emphasize that broad membership of various disciplinary members of a diverse end-user community, including such new potential users as the media, recently interested in the use of remote-sensing for news gathering in space, we believe that this kind of end user participation will go a long way toward preventing past problems of developing space remote-sensing technologies which must after the fact find applications to justify their continuity.

Under section 501(f)(1), we also would encourage this advisory committee to review and assist NASA with respect to the NASA-NOAA congressionally mandated national—unified national plan.

We hope that perhaps this will even speed up the process.

This national plan, as far as we know, has not yet come forth and therefore leaves the United States without a comprehensive national plan for future satellite remote sensing.

Geosat supports provisions which would assist in evaluating Federal agencies, the potential or real commercial value of experimental data sets and the likelihood of competing with licensee's data.

We believe that this is vital to access to experimental data as I will discuss in a moment.

In addition to the above comments, I would also like to comment, we believe the National Remote-Sensing Advisory Committee could and should be chartered to review and advise the Secretary on the proper balance between national security and foreign policy interests as required in section 607 of the Landsat Act of 1984 and any conflicting matters affecting the successful transfer of land and ocean observation systems to the private sector.

Finally, we hope that the Congress will review this committee, if you establish it, and if necessary add to its authority and strength to accomplish the goals stated.

Regarding our interest in clarification of access to experimental data, we have testified, again in the same included testimony, about our concerns about access to experimental data.

The Geosat Committee, in reviewing these amendments, wishes to reiterate our fundamental position with respect to access to experimental data. We believe that the intent of the Landsat Act of 1984, in particular as it describes nondiscriminatory data availability, should be applied equally as well to experimental data gathered in a Federal experimental remote-sensing program; that is experimental remote-sensing data generated by unclassified Federal programs should be made available to nongovernment user communities under reasonable guidelines as reviewed by the national advisory committee.

The Geosat Committee further believes it is imperative under the definitions for "any commercial purpose" or "in a substantial competition" of sections 502(a) (1) and (2) in the amendments to further clarify either in amendments or perhaps by the National Remote-Sensing Advisory Committee or some other effective mechanisms.

We concur with the intent of these sections to protect the commercial viability of the systems operator against unrealistic competition for experimental data.

However, we believe that it is in the best interest of the Federal agencies, the systems operators and the end user community that the latter have access to experimental data and be allowed under reasonable guidelines to utilize or try out such experimental data in the field and under nonoperational, but commercial modes in order to evaluate its practical utility in dealing with the end user requirements.

My final comment is that I must make an important comment from the Geosat Committee with respect to our concerns about continuity of civil land remote sensing in the United States.

The most important recommendation that I wish to make to you is that the Congress complete what you started with the Landsat Act of 1984.

This is my 17th testimony in 10 years on Landsat and related issues and it is almost ludicrous to come this far with respect to the transfer of the technology to the private sector under the Landsat Act and see in this 1987 budget year zero budgeting for the last phase of this transfer.

We wish to encourage you and other Members of Congress to do what you can to encourage funding to complete this transfer so that we move on as the intent and the will of Congress to transfer this technology to the private sector.

Thank you, sir.

Mr. NELSON. Thank you.

[The prepared statement of Dr. Henderson follows:]

STATEMENT OF
DR. FREDERICK BRADLEY HENDERSON III
PRESIDENT, THE GEOSAT COMMITTEE, INC.
SAN FRANCISCO, CALIFORNIA
BEFORE
THE SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS
OF THE
COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, D.C.
16 JULY 1986

Mr. Chairman and Members of the Subcommittee.

I am pleased to have the opportunity to appear before the Subcommittee today on behalf of the many members of the Geosat Committee who are working towards the further development and useful applications of the Landsat-type land and ocean satellite remote sensing technology. Our testimony today is in support of the proposed amendments to the Land Remote-Sensing Commercialization Act of 1984 (PL 98-365). We support the Findings and Purposes of the proposed amandments in H.R.4932, the "Land Remote-Sensing Commercialization Act Amendments of 1986" particularly where they serve to better define the relationships and working mechanisms among the Federal and the private sector entities involved. It is important to note that other countries developing comparable land and ocean satellite remote sensing have already developed workable mechanisms to actively involve both government and private sector interests in the planning for and the development of these important national technologies.

The various members of the Geosat Committee and others in the remote sensing community at large believe the Landsat Commercialization Act of 1984 is fundamentally a good law supporting the governmental decision to transfer this technology to the private sector. Although we reserve the right to judge the ultimate wisdom of this government-only decision, we support the Landsat Act and its present goal, and further support in general the proposed amendments to the Act as necessary to better implement the intent of the Administration and Congress to accomplish this technology transfer to the private sector while serving the public good. To be successful, this transfer must involve a strong and well established working relationship between all government and private sector interests involved.

We strongly support the proposed amendments in general and wish to offer some comments for consideration which we believe will strengthen the intent and implementation of the proposed amendments.

Establishment of a National Remote-Sensing Advisory Committee.

The Geosat Committee strongly believes that the orderly, continued

technological development of U.S. land and ocean satellite remote sensing capabilities will depend on the establishment of strong cooperative and interactive mechanisms for decision-making and shared responsibilities of both the government and the private sector to the planning and funding of future basic science, research, and applications, and for the technology development necessary for the continuity of civilian government and/or commercial private sector systems in the United States.

On 13 November 1985, we recommended the establishment of an effective government-private sector advisory committee for remote sensing modeled after the succesful Solar System Exploratory Committee (SSEC) as well as the establishment of an ongoing government-private sector advisory/oversight forum in our testimony before the Senate Subcommittee on Science, Technology, and Space. In December 1985, we further urged that the National Commission on Space to recommend the establishment of an on-going government/industry/academic/user advisory review forum in its report to the President and to Congress (Geosat Statements to the NCS of 16 and 31 December 1985 are included for the record). We are aware that NASA and NOAA may not desire any additional advisory committees to oversee their activities. However, in concert with the expressed will of Congress to further the private sector commercialization of these systems where appropriate, we strongly believe that all interested parties in both the government and the private sector must be a part of and jointly responsible for overseeing the continued development of this technology in the United States. Other countries, such as France and Japan, who are developing state-of-the-art satellite remote sensing systems have already created mechanisms for joint government-private sector development of their systems. The Geosat Committee believes that the United States must also establish a joint government-private sector interactive decision-making mechanism.

As a major step towards our recommendations see above) The Geosat Committee strongly supports the establishment of a National Remote-Sensing Advisory Committee as presented in Sections 6, and, specifically, 7 of the proposed Amendments, and with the following comments:

1. Under Section 501 (f), the wording regarding the membership should emphasize the broad participation of various disciplinary members of the diverse the end-user community, including new potential users such as the media, which has recently become interested in the use of remote sensing for news-gathering from space. This broad end-user membership should go a long way to solving the historical problem of developing remote sensing technologies which must find applications after the fact to justify further continuity.

2. In Section 501(f)(1), we agree that the National Remote Sensing Advisory Committee should provide advice and policy recommendations on user needs to NASA and NOAA for their congressionally-mandated unified national plan. In fact, we hope that such a requirement might speed up the required reporting of the unified national plan to Congress, which so far has been held up by the Administration; leaving the U.S. with no comprehensive national plan for future satellite remote sensing.

3. The Geosat Committee particularly supports the provision in Section 501(f)(2) which would have the National Remote-Sensing Advisory Committee provide recommendations to Federal agencies sponsoring research programs on

the commercial value, REAL AND/OR POTENTIAL, of specific experimental data sets and the likelihood of competition with liscensees' data. We believe this is a vital role in assuring user access to experimental data (discussed below).

4. We also strongly support Section 501)(f)(3) which could encourage more cooperative test and applications demonstration projects which we believe are vital to the successful transfer of the Landsat and similar programs to the private sector. In recent years, with the transfer of the Landsat program from NASA to NOAA, NASA's remote-sensing research has turned away from practical land observation applications demonstration projects. We believe that this trend must be reversed and that NASA should continue to participate in such cooperative programs with systems operators, end-users, and others in order to further justify continued support for their basic remote sensing research programs.

In addition to the above specific comments, we believe that a National Remote-Sensing Advisory Committee could and should be chartered to review and advise the Secretary on a proper balance between the national security and foreign policy interests as required in Section 607 of the Landsat Act of 1984 and any conflicting matters affecting the successful transfer of land and ocean observation systems to the private sector.

Finally, we hope that Congress will continue to review for effectiveness, perhaps require periodic reports from a National Remote-Sensing Advisory Committee, and, if necessary, provide it with more authority in order that it may ultimately serve the purpose of providing a joint government-private sector interactive decision-making mechanism.

Clarification of Use of Experimental Data.

Sections 8 and 9 of the proposed Amendments deal with the clarification of the use of experimental data from federal and non-federal research and development programs. The Geosat Committee has previously established its strong requirement for access to experimental data (see Senate and NCS testimony). In reviewing the proposed Amendments, we wish to reiterate our fundamental position on access to experimental data. We believe that the intent of the Landsat Act of 1984, in particular as described for data generated by a system operator with respect to nondiscriminatory data availability, should be equally applied to data gathered in Federal experimental remote-sensing space programs as defined in Sections 502 and 503 of the Landsat Act of 1984. That is; experimental remote sensing data generated by unclassifed Federal programs should be made available under reasonable guidelines to the non-government user community and as reviewed by a National Remote Sensing Advisory Committee such as defined in Sections 502(a) and (b) and Section 504 of the proposed Amendments.

The Geosat Committee furthers believes it imperative that the definitions of "for any commercial purpose" or "in substantial competition" of Sections 502(a)(1) and (2) be defined or further clarified either in these Amendments, by a National Remote-Sensing Advisory Committee, or by

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some other effective mechanism. We concur with the intent of these sections to protect the commercial viablilty of the systems operators against unrealistic competition from experimental data. However, we believe that it is in the best interest of the Federal entities, the systems operators, and the end-user community that the latter have equal access to experimental data and be allowed, under reasonable guidelines, to protect themselves against unwarrented abuse to utilize such experimental data "in the field" in a non-operational commercial mode in order to evaluate its practical utility in dealing with end-user requirements. Such use of experimental data by the end-user community under the conditions of reporting the results of such applications testing should benefit the Federal agencies' experimental programs and the commercial market evaluation of such data by potential bidders for "en-bloc" purchase of such data for commercial data dissemination.

Concluding Comments: THE CONTINUITY OF CIVILIAN LAND REMOTE SENSING IN THE UNITED STATES.

The most important recommendation that I can make today to the Subcommittee on behalf of the Geosat Committe and others in the user community is to urge you and the rest of Congress to complete what you started with the Landsat Act of 1984. This is my 17th testimony in 10 years on Landsat and related remote sensing issues before your committee and those of your collegues in the Senate. To have come so far as to testify on amendments to the Landsat Act and at the same time to see an OMB-led Administration budget with ZERO funding for the last phase of the transfer of the Landsat program to the private sector is ludicrous at best.

To paraphrase portions of Section 101 of the Landsat Act on 1984, "use of land remote-sensing data has been inhibited by slow market development and the lack of assurance of data continuity" and "cooperation between the Federal government and the private sector can help assure both data continuity and U.S. leadership". The Geosat Committee urges Congress to abide by its own findings and by the intent and will of Congress as expressed in the Landsat Act of 1984 and provide the necessary funding in the 1987 and 1988 budgets to complete the agreed-upon transfer of the Landsat Program from NOAA and the Department of Commerce to the designated systems operator, EOSAT. Data continuity of this important U.S. technology can thereby be assured to the user community which has placed its faith in the Landsat Act.

Mr. NELSON. Thank you.

I happen to agree with you. That is part of the frustration. We need to move this whole process off dead center and get it moving for the sake of this country.

Mr. Walker?

Mr. WALKER. Thank you, Mr. Chairman.

Dr. Henderson, I am not certain I followed completely your point. Under section 501(f) regarding the membership on the advisory committee I think you were talking about, and you make one point I want to follow up on, but I gather what you are saying is one of the problems with the advisory committee, as being suggested here, is the fact that you may get as we expand the technology and expand the usage, you may get far more users than are presently anticipated under the advisory committee and we need to make absolutely certain if you are going to have such a thing that everybody gets included; is that what you were saying?

Dr. HENDERSON. In a sense; Yes, sir. Obviously, you can't have an unwieldy committee, but it has been our experience over the 10 years I have been involved in this that advisory committees do not really have substantial participation by what I call the end user, that Congress and the administration look at the user community as providing data systems, but not the ones actually using the data in the field, so to speak.

It is important if we are going to short circuit the problem of creating technologies looking for uses that the users be involved as early as possible in an advisory role.

Mr. WALKER. I think that is an important point because we are in an area here in much of the space business where we can't even anticipate a lot of the uses that are going to be made of what we are doing.

If we set up commissions and advisory councils or whatever we do in government that tends to limit the scope of what people are doing, we will self-define the limits along the way and I think we have got to be very, very careful that we don't basically stop progress by simply the way in which we define what it is we think is going on and I think that the point you made about the news media is a very, very important one. It is one that I have been following recently.

As I gather, the news media is really looking at the present time at the idea of remote sensing as being an important new addition to everything that they do in coverage of world affairs, and maybe even national affairs, but particularly world affairs, because they are all of a sudden figuring out that it would be more economical to do some of the coverage they want to do of events from space and moving a satellite around than it is to have a reporter on the ground full time to cover fairly nominal events, and it is, I think, one of the technologies that may become as important in news gathering in the future as bouncing signals off satellites now is to them in terms of getting their reports back for the evening news.

It is something we haven't thought a lot about before, but it could be one of the end uses of this type of technology that we are going to see as being a major element in the future, and so you know, I think your pointing it out to us is very, very important and

I think we have got to be very careful where we go in that direction.

Mr. Williams, you are shaking your head. Do you generally agree with that?

Mr. WILLIAMS. Generally, yes. I think the two words that describe it appropriately are appropriate representation from the community at large, both industry and the user group, whether they are system operators or users in particular.

Mr. WALKER. Do you run the danger along the way that at any point you may have appropriate representation of that which is and still be freezing out that which is to come or that which is looking? Just by the fact that the people who are already in the system have their representatives there, they in fact discourage other people from getting into the system because those people are protecting their interests and in some cases their interests would be in direct conflict with somebody on the outside that is looking at the technology, do we run that type of danger?

Mr. WILLIAMS. You always run that type of danger with any committee. The point that we have to look at and the type of thing that we are trying to do in long-range policy is trying to look at the uses or the applications of the data from now to the year 2000. The news media happens to be one of those potential large users as do a number of other communities. The United Nations in particular is taking a very hard look at it through the Peaceful Use for Outer Space Committee and we appear before that committee roughly once every 6 months now, strictly to talk about remote-sensing as an activity.

So it is very important and it is very important to try and have appropriate representation both domestically and internationally.

Mr. WALKER. One of the things that has been suggested along the way, and it is not—I don't know whether it falls into this category of remote sensing or not because it is not quite the same thing, but the proposal that some people have had of tracking, for instance, trucks around the country by doing it from a fairly low orbit, but nevertheless being able—to follow freight, for instance—being able to figure out where their trucks are and give real time information to headquarters about where their trucks are which allows them to disperse their fleet more efficiently and economically and so on.

I don't know if that is one of the things being looked at, but it is one of the suggestions as something that could be done with satellite technology that might have a great deal of business application.

If it is not being discussed, where would that fit into this plan?

Mr. WILLIAMS. I am afraid that would fit into what I call the very long-range policy relative to implementation. It has been mentioned in two different subcommittees, but by the same token, 20 years ago it would have been a Buck Rogers type of application. We believe there are a number of applications such as in DOT for transportation needs that could possibly be a good utilization of satellite data, but probably some time beyond the year 2000.

It is not in the near term with the current issue or climate of satellite data and the type of applications that we have available right now or sensors that we have available, but there is a good

possibility that it is a high-use application that could develop in outer years.

Mr. WALKER. But my concern is if we have already, say, consigned that to the year 2000 and beyond, is there a danger in having the people who are present users make that determination and thereby say, "Well, it can't be done now," and basically cancel out the market?

The problem is that having set up an independent advisory committee, it kind of becomes the experts on all this so if somebody wants to make an investment in that, the first place a lot of the investors go is to find out what this advisory committee has to say. If that advisory committee is saying, "We don't think that is practical before the year 2010," a lot of investors will say, "That is it for me. I can't wait until 2010 to begin making money on this."

Isn't there some danger that, in fact, you do begin to cancel out technical options?

Dr. HENDERSON. If I may comment. I think I am sensitive to what you are saying and I certainly agree with you. I think the example—in this news-gathering business, there are a lot of institutional problems associated with what the media wants.

On the other hand, you have to think in terms of how do you evaluate, for example, the coverage of the Chernobyl event on the media and the impact that had on the Russian response to the world in responding to what happened. That was a news event and I agree with you that this is such a rapidly changing technology that we need to keep the door open.

Mr. WALKER. With what we are talking about, you have raised the issue, what we are talking about on the news gathering, if I understand it correctly, the news media is really talking a system there that literally would have been able to cover the Chernobyl event even though the Soviets didn't give them access to the site; is that correct?

Mr. WILLIAMS. Yes.

Mr. WALKER. So you really do change the nature of news gathering in the world. Right now when we are being shut out of coverage of riots in South Africa, you literally could cover riots in South Africa using remote-sensing technology and if the South African Government didn't like it, so what? It could still get on the national media in the United States and it is exciting in terms of opening up information to the world.

Mr. WILLIAMS. That is where appropriate representation on the committee provides you with that long-range thinking and long-range policymaking.

If you have an adequate representation from all of the communities, the user, industry, academia, and government, you should be able to formulate policy that will help you look at applications in the future that are not possible now, just due to long development cycles, the long budget cycle and the other elements that provide the proper sensor technology to cover such things as a riot in South Africa.

Mr. WALKER. I thank the chairman.

Mr. NELSON. Well, Mr. Walker, you have raised in a visionary way some of the potentials in the day-to-day applications of this

that people really haven't thought about, and it is. It is revolutionary. It is exciting.

Let me get back to some of the more mundane problems about getting this thing off the ground in the first place. Now, the House Appropriations bill for the Department of Commerce which passed last night in the House, would provide Eosat with $75 million in fiscal year 1987, which is about $12 million less than was projected from last year.

What effect would this appropriation and your comment on the reduction versus the projections, what would it have on Eosat remaining a viable entity?

Mr. Williams.

Mr. WILLIAMS. I think the direct answer to that is it would have a minimal effect. We have assessed the reduction in the 1987 funding and we believe $75 million will allow Eosat to remain a viable entity, although it would have some minor effect on schedule.

Overall, the effect is minimal. The intent is to remain a viable entity and still provide services and I believe we still have that capability at the $75 million level.

Mr. NELSON. I know that there has been a great deal of frustration within NOAA over the inability to move the Office of Management and Budget to get them forthcoming on the question of what was originally set as the funding level, that we would proceed and have this viable entity, and we would have this technology, and so forth.

How about giving me your opinion now? NOAA is trying to, out of the midst of chaos, create something from the ashes by going to the Omnistar as the bus with this kind of appropriation that we just talked about.

Why don't you compare what it looks like we may be getting vis-a-vis this appropriation that just passed last night, as compared to what we were originally projecting to get, and what do we get less? What are the disadvantages? What may be the advantages?

Why don't you sketch that for the record.

Mr. WILLIAMS. I can only comment on specific portions of that, Mr. Chairman, because I am only privy to a part of that proposal and obviously we have been in discussions with OMB about a certain portion of that.

The proposal that is presently before OMB is a multimission proposal involving a combination of Landsat and Metsat instrumentation. It is an attempt by NOAA to combine both missions at a lower overall budget value.

The intent there is to try and save moneys in the 1987–88 time frame and in the long range a 15-year timeframe or total program timeframe as far as the budget process is concerned.

The estimates that I have seen indicate that NOAA's projection is somewhat in excess of $600 million in savings over the 15-year timeframe.

The present program or the $75 million that was passed last night as far as appropriations is to support the current program, which is the Landsat Program only, but to the extent that it does provide an application to the Metsat as an independent program—the Omnistar is strictly, as you mentioned, a bus or a platform to support both instrumentation elements.

The proposal before OMB is a multimission proposal and it is still before OMB and has not been released and that in particular would combine both programs and offer the benefits of a single platform.

If the multimission proposal is denied, it would mean that in order to continue with both programs, you will be talking about a total of five buses, whereas the multimission proposal talks about three buses. That is, part of the decrease in cost is to combine functions, both the weather satellite and land satellite, on one or two or three buses.

I believe the scope of the program is the same that I reviewed once before indicating that the multimission proposal basically would allow the Landsat Program to continue, would allow the Metsat program to continue, and it would provide the a.m. and p.m. flights for the weather satellites, which a number of people in our country, and I personally, believe are an absolute necessity for correct weather forecasting.

Mr. NELSON. What is not provided that you originally planned on?

Mr. WILLIAMS. As part of the current program, I believe that as far as Landsat is concerned, there is nothing that will not be provided or not accounted for under the multimission proposal. I believe it is all inclusive as far as Landsat is concerned, as far as applications and the appropriate sensor technology, in order to maintain the commercialized remote sensing as an active or a viable industry.

I don't believe we have been shortchanged at all in the multimission proposal. I do believe it offers an adequate compromise based upon the budget situation that we have both in 1987 and 1988.

Mr. NELSON. You are saying nothing is lost?

Mr. WILLIAMS. As far as Landsat is concerned, I don't believe anything of major value has been lost in the multimission proposal at all. No, sir.

Mr. NELSON. What about Metsat?

Mr. WILLIAMS. I think Dr. Bishop would have to answer that question. My personal opinion is that there have been no major losses as far as the Metsat is concerned.

Mr. NELSON. Well, I get a little exasperated. Aren't we talking about—this is about $250 million less and you are saying that for $250 million less—is that the figure—what is the total runout difference? Does somebody from NOAA want to come up here and tell us what? Just join us at the table, if you would.

Why don't the rest of our witnesses just join us at the table.

Dr. Tilford and Dr. Bishop.

STATEMENTS OF DR. SHELBY G. TILFORD, DIRECTOR, EARTH SCIENCE AND APPLICATIONS DIVISION, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION; AND DR. BILL BISHOP, NATIONAL OCEANIC AND ATMOSPHERIC ADMINSTRATION

Mr. NELSON. What is the total runout difference?

Dr. BISHOP. Mr. Chairman, I am Bill Bishop from NOAA. I am not at liberty to talk about the detailed numbers in the proposal that we have under discussion because some of our analysis

changes as we go along and refine it. I can talk qualitatively about what would be expected, and I think Mr. Williams correctly characterized that, in the out years, less satellites would have to be bought in such a combined proposal and therefore the savings in that would be substantial.

Mr. NELSON. With no less service?

Dr. BISHOP. In principle, sir, no less service.

Mr. NELSON. Let's talk practical; not principle.

Dr. BISHOP. There are some things under discussion within the analysis of our proposal that would cause some of the instruments, to be deleted in order to stay within some budgets. Those are not fully confirmed.

Mr. NELSON. What are some of those instruments?

Dr. BISHOP. The two instruments under discussion are one of the sounders called the HIRS or high resolution infrared sounder and an ozone-measuring instrument called SBUV or solar backscatter ultraviolet spectral radiometer.

Mr. NELSON. And those are the only two instruments?

Dr. BISHOP. That might be deleted; yes.

Mr. NELSON. From what was originally planned; is that correct?

Dr. BISHOP. That is correct.

Mr. NELSON. And what was originally planned? I am calling on my memory from a couple of years ago—was a Federal investment to the tune of somewhere around $250 million, wasn't it?

Dr. BISHOP. For the Landsat system?

Mr. NELSON. Yes, sir.

Dr. BISHOP. Yes, sir; plus some launch costs which brings it up just short of $300 million.

Mr. NELSON. That was $300 million originally.

Now, how much are we going to spend compared to $300 million?

Dr. BISHOP. For Landsat, it would have to be something similar to keep the program viable. For the Metsats, if there were less satellites to be bought, it would be less cost for the Metsats, so you have to compare both missions in summation rather than just one singly.

Mr. NELSON. I need an answer to my question. I am trying to compare. What was planned? What is, in fact, now projected and what are we getting less for what is now projected than what was originally planned?

Dr. BISHOP. I understand, sir. I don't have the numbers with me, but in the NOAA budget of 1986, as opposed to 1987, were projections for both systems, for Landsat and the Metsats, which gives us one number.

The projections in a combined system would have to sum both of those systems again, but there would be several satellites in the out-years, beyond 1985, that would not have to be bought, as a result of a combined mission, and therein lies the major savings.

Mr. NELSON. Would you provide that to us?

Dr. BISHOP. Well, sir, as soon as it clears the Administration review.

Mr. NELSON. When will that be?

Dr. BISHOP. Hopefully soon, sir.

I can't give you a firm date, but we are down to the last few issues that we have to resolve, that surround launch vehicles, quite frankly.

Mr. NELSON. Is it fair to say that you are trying now to catch up since the Appropriations Committee has gone ahead and passed this appropriations bill?

Dr. BISHOP. You know the work of the Congress better than I do, sir, but I think that is fair to say.

Mr. NELSON. Normally, isn't it the other way around? Normally, you would think the administration proposes and the Congress disposes. It looks like this way the Congress is proposing and the administration is trying to figure what it is doing.

Dr. BISHOP. Yes, sir. I think it probably does appear that way, but you have to recognize that the opportunity to do something like we are discussing within the administration did not become available to us until Eosat proposed the Omnistar spacecraft for Landsat. We reviewed that and accepted it in January, so it was only in January that we had the opportunity to consider such a combined mission and it has taken us awhile to do the analysis.

Mr. NELSON. Why was that in January?

Dr. BISHOP. Eosat proposed a change in the spacecraft for Landsat alone. We reviewed that after they proposed it, the official proposal was November. It took us several months to review it. We accepted their proposal in January.

Only at that time did we have an Omnistar-type spacecraft that we could consider for a joint mission, and really only then could we begin a detailed analysis of it. It has taken us a few months to review it in the administration.

Mr. NELSON. Help me understand. Why wasn't the Omnistar proposal conceived earlier than this January?

Dr. BISHOP. Perhaps I could get Mr. Williams to join me. The original proposal by Eosat——

Mr. NELSON. He is not leaping to share.

Dr. BISHOP [continuing]. Was for a Tiros design spacecraft, a design similar to that which we are flying today on our meteorological satellites. That was the plan until some time late last summer when the RCA partner in Eosat came forward with a suggestion that the bus be changed to a new design called Omnistar.

At that time, Eosat analyzed that and came forward to us last autumn with a proposal to do just that.

Maybe Mr. Williams wants to add to that.

Mr. WILLIAMS. I think that is fair. At the point in time late last summer when RCA came forth, we were looking at expanding the capability of the existing platform. Utilizing the Tiros bus did not provide us with any expansion capability nor the ability to fly any small scientific experiments which we had discussed with one or two agencies.

We looked at an alternate bus. We, meaning our partners. RCA looked at an alternate bus and proposed the Omnistar platform as a larger platform that could fly for the same fixed cost. There were additional moneys to be invested, but RCA opted on their own right to invest those moneys to support the Omnistar bus in order to remain within the fixed-price contract for the satellite or for the satellite bus.

So it was a matter of adding additional capabilities and providing a bus that had expansion capability for instrumentation that allowed NOAA to develop the plan for the multimission.

I agree with Dr. Bishop that that plan couldn't come to any form of fulfillment until the late January timeframe because that is the point in time when the actual proposal was submitted in detail by Eosat.

Mr. NELSON. OK.

I want you all to talk to us about these two instruments that are omitted. What is our lack of capability as a result of these two instruments that were originally planned that now are omitted?

Dr. BISHOP. Perhaps I could do that briefly now, sir, and at some other occasion in detail with your staff.

First of all, they are not yet omitted officially in any way. They are under discussion within the administration.

I can describe briefly what the two instruments do and what we might lose.

I am afraid I am not qualified to discuss the significance of that, but I can tell you just briefly what they are. The one called HIRS is our main sounder today. We had planned, and still plan, to change our main sounder to one called the advanced microwave sounding unit [AMSU]. Those are already under contract with the Aerojet General Corp., and we expect to deliver those in time for the next series of the meteorological satellites, NOAA-KLM in our nomenclature, or in time for that joint mission.

That will become the backbone of our temperature soundings for numerical weather forecasting.

The present infrared instrument, the HIRS, could at some time in the future be deleted if the AMSU proves itself as effective as we think it will be, and the discussion ongoing is when to delete that, and if to delete it.

There are some things that infrared instrument can uniquely do in measuring surface temperatures, skin temperatures of the Earth and we have yet to evaluate just what impact that has on the overall use in numerical forecasting.

The ozone-measuring instrument, called SBUV, is the only instrument that anyone is flying right now to measure global ozone concentrations. The reason we would consider deleting such an instrument would be for budgetary purposes.

Mr. NELSON. So it sounds like these instruments that may or may not be omitted, that from the standpoint of information which can be marketed, you have lost no information from these instruments; is that a fair statement?

Dr. BISHOP. For marketed data, that is probably true, sir, but they are not Landsat instruments. They are part of the meteorological satellite payload.

Mr. NELSON. Dr. Tilford, do you want to make any comments about those instruments potentially lost?

Dr. TILFORD. I would like to comment on the ozone instrument. With the development of the ozone hole over Antarctica and our lack of understanding of this particular phenomenon, we think it is absolutely mandatory that we have a continuous capability to monitor ozone over the next decade. This has some potentially serious

implications on future international regulatory issues concerning CFM's and a number of other greenhouse gases.

We are very concerned about the potential of losing this long-term data set. We have monitored, ozone with NIMBUS 4 and NIMBUS 7, and the current operational Metsats and we believe that this kind of monitoring is an absolute requirement for the future. We are extremely concerned because of their role in the Upper Atmospheric Research Program about the potential loss of these global ozone data.

There are differences of opinion within the community as to what the absolute loss of an infrared temperature sounder may or may not be, depending upon the caveats discussed.

If the AMSU provides all the capability that it might provide, there may be a minimum impact due to the loss of infrared sounding. However, if that is not the case and there is any degradation in the data reduction capability, I think that this has to be looked at in some detail and we have a number of scientific groups looking at those tradeoffs right now.

Mr. NELSON. Dr. Tilford, if you could talk just a little louder. Your comments are most appropriate.

Let me go to the other end of the table to NOAA.

Dr. Bishop, you have a statutory requirement to monitor ozone. How are you going to fulfill that statutory requirement?

Dr. BISHOP. Sir, at the moment, the present administration program is to do two things: continue ground measurements of ozone and to continue to fly the solar backscatter ultraviolet instrument on the meteorological satellites.

Mr. NELSON. You have suggested that you could monitor that ozone so much more completely if you had this instrument.

Dr. BISHOP. We are doing it today and the plan in the budget submitted to the Congress is to continue to fly it indefinitely.

Mr. NELSON. Including the one that you say you may omit?

Dr. BISHOP. That is under discussion in the joint mission proposal that is under discussion in the administration. The official proposal before the Congress is to continue that indefinitely.

Mr. NELSON. And that discussion, you say, ought to be getting a resolution or conclusion within the next few weeks?

Dr. BISHOP. I didn't say in the next few weeks, but that would be my hope.

Mr. NELSON. We will look forward to receiving your conclusion and then we can proceed from there.

All right. Now, would you all help educate us? What is the capability of what you are preparing now with the Omnistar as compared to what the French have up and what the French are planning for the future and trace that in the sense of data that is valuable to governments and data that is valuable to private enterprises.

Who wants to start? Now, I want clear answers on this. I don't want a lot of words. I want clear answers and I want you to hit directly on that question.

Mr. WILLIAMS. I will try.

First of all, the SPOT satellite which was launched recently has a number of unique advantages over the existing Landsat system, but by the same token, the Landsat system has other advantages.

The basic SPOT instrument is a three-band instrument, so it has a very limited frequency range.

The Landsat instrument, the basic instrument is a Thematic Mapper, a seven-band instrument with a very wide frequency range.

A particular example of that would be to the extent that the frequency range of the Thematic Mapper reaches up to the 2.2 micron region, in that region, that is a critical region in the search for oil and gas.

If you are looking for particular minerals such as kaolinite in the search for oil and gas, you need that 2.2 micron band to differentiate between kaolinite and the lack of kaolinite in a ground search utilizing satellite remote-sensing data.

SPOT does not have that capability. The SPOT instrument has a scene size of 60 by 60 kilometers. The Landsat scene size or the size of the actual image is 185 kilometers by 170 kilometers, actual trim size.

So actually, the Landsat scene size is synoptic or wide ranging. It has eight to nine times the actual scene area or surface area coverage that the SPOT instrument does. It also has significant frequency advantages as far as having additional band combinations and the capability of providing additional products.

The significant advantages that the SPOT instrument has is its 10-meter resolution. The SPOT resolution has a 10-meter black-and-white resolution, a 20-meter color resolution. The Thematic Mapper, as a basic instrument, has a 30-meter color resolution. That is the surface area or the ground resolution, the size of an object that can be viewed on the ground.

So there is some definite advantage to the SPOT instrument as far as resolution. Because they fly two instruments at one time, they have a stereo capability which allows them to sweep and see a broader area on each pass of the satellite over the Earth. They are both low-polar orbiting satellites, Sun-synchronous.

To that extent, SPOT is able to visit any one spot on the Earth in a much more frequent time or fashion than Landsat can. Landsat basically around the Equator visits any single spot on the Earth every 16 days.

SPOT has the capability of visiting any single spot around the Equator once every 3½ days. That is due to stereo coverage and wide-sweeping coverage.

By the same token, if you compare not only the fact that Landsat has synoptic or wide-ranging coverage, which is advantageous for agricultural purposes, it has a higher frequency band combination which allows it to be very useful for oil and gas exploration and compare the price structuring, the product structuring that we have now versus what SPOT is structuring, you will find that the price of the comparable Landsat product is about one-fourth the price of a SPOT product basically because of the scene size.

If an agricultural user wants a large scene area or we have provided many, many scenes of Africa and South America in order to provide the same type of coverage, SPOT would have to mosaic a large number of scenes in order to provide a comparable single scene from Landsat. So there are some distinct advantages both on one hand and on the other hand.

By the same token, as far as the market is concerned at the present time, SPOT being a new instrument and having a 10-meter black-and-white capability, which is a very high resolution capability which allows them to differentiate smaller objects on the ground, has received a large number of startup orders.

We believe that they will accrue a percentage of the market both domestically and internationally, but by the same token, I think that after the first year to year and a half that part of that market is going to tend to level off because people are generally going to be looking for wider coverage and greater economy in the product that is provided to them, and I think that that greater economy will start to show up in about 12 to 18 months, so they will have a definite impact on the current market, but I think that we can level off part of that percentage in the outyears.

One other point that you asked about was the outyear application of SPOT. SPOT is basically a national resource as far as the French are concerned. I don't need to describe that, but basically the intent there is that is a long-term supportive program. The current satellites have a 2-year life; Landsat has a 5-year minimum life for the instruments.

SPOT plans to replace the first two sets of instruments on a 2-year cycle and then expand to a 4-year cycle later in the life term. Their current program calls for them to go to the year 2000, as does Landsat, but, by the same token, each upgrade that they provide in the way of instruments provides them with greater resolution and greater capability.

The instruments that they are planning on flying in the 1990's currently have either five or seven bands; they haven't made that decision yet. They do know about the problem they have in the 2.2-micron band, the lack of it. So they are considering adding that, and they are also considering another instrument to support their 1988 and 1990 launches.

So they do have a long-range plan, they do plan to upgrade their instrumentation, they have the direct support of the French Government and of a number of private concerns that are quasi-government agencies, and by that token they have the ability to penetrate a much larger share of the market in the outyears with their new instrumentation.

In the case of Landsat, there has been some research going on by NOAA and NASA, and if the instrumentation either from Government or from private industry is not available in the timeframe from 1990 and on, we can see a loss of a larger share of the data market and also a loss of capability as far as U.S. Government agencies are concerned.

Mr. NELSON. All right. That was very clear. I appreciate that very much.

Now you talked about the improvements that SPOT would be making over the course of time. Are you talking about improvements that would affect that 10-meter resolution?

Mr. WILLIAMS. Yes, sir.

Mr. NELSON. So it would become less meters than 10 resolution.

Mr. WILLIAMS. SPOT has a consideration for reducing their—or increasing their resolution, if you will, the correct term—to 5 meters in the outyears.

Mr. NELSON. We could not do that on what we're planning on Landsat.

Mr. WILLIAMS. That's quite true. What we're planning currently on Landsat—our plan for the outyear for Landsat is to add a 15-meter panchromatic or black and white band as part of our launch capability in the 1989–90 timeframe.

Mr. NELSON. So does that mean that the American news organizations in the use of the data, for example, in checking out what's going on on a future story such as the Chernobyl incident, would contract then with the French system instead of the American system?

Mr. WILLIAMS. Yes, that's quite possible.

My understanding of the appropriate way to approach that, such as was done in Chernobyl, Landsat provided the majority of the data—probably 80 or 90 percent of all the data that was used—but then the French 10-meter data was overlaid with the Landsat 30-meter color data to provide a singular specific product as far as looking at certain elements of the Russian plant. So there was a combination of data that was provided there which provided a new product, if you will, a new value improved product.

Mr. NELSON. And there was another advantage to the French system in that the coverage was every 3½ days as opposed to I think you said 16 days.

Mr. WILLIAMS. That's quite true.

That time zone, remember, does change, and we're talking about the Equator. As you move 20 degrees above or below the Equator, the satellite paths start to converge and you get more frequent coverage.

As you get in the higher hemisphere, in fact, in the areas that we are concerned with, you're talking about a Landsat coverage of approximately every 6 or 8 days. But there is no doubt that the frequency of coverage is a direct benefit.

Mr. NELSON. All right. Now let's talk about the Japanese. It's my understanding that they are constructing a satellite which has four instruments on it that Eosat would like. Is that true? And tell us about it.

Mr. WILLIAMS. As you made the statement, I don't believe that's true. At this moment, I don't know what all four instruments are. Eosat would like to have any instruments that anyone would like to donate to the platform.

But, generally, the two major instruments on the Japanese platform are an optical instrument, which is basically a replication of the thematic mapper as a sensing instrument—a remote-sensing instrument.

That is a wide-ranging instrument. It has different characteristics than the thematic mapper, but it will provide the Japanese with the type of coverage that they are seeking relative to synoptic data, a wide-ranging coverage for their ocean and fisheries program and for their land use program.

The other instrument that they have, that I'm aware of, is radar. Now the radar that they are proposing is a replication of the radar, I believe, or similar to the radar that is going to be flown on the Radarsat Program by the Canadian Government, but I can't give

you any specific details about that, and, truthfully, I do not know the details of their other two instruments.

The only approach that we have made or indications that we've had in cooperation with the Japanese Government is a combination of data, trying to trade or discuss the exchange of data for future archiving purposes between the Japanese and the American satellite.

The Japanese launch profile, by the way, they are now indicating that they may be able to launch as early as December 1987. They've moved up their program about 1 year, from the last discussion that I've had with them, prior discussions.

It also is an impacting program as far as the world market on data is concerned. They are primarily concerned with the Asian theater, which is growing in leaps and bounds in the actual use of data. So we can see a large penetration by the Japanese in that area which will affect not only Landsat but affect SPOT themselves.

Mr. NELSON. Does that start to threaten as a commercial entity Eosat's enterprise?

Mr. WILLIAMS. I don't believe so. We've taken the Japanese program, we have taken the European or ESA program—European Space Agency program—and also the French program into consideration when we developed our profiles for the international markets. I believe that we've made an adequate consideration for those.

Mr. NELSON. Let me ask you all—well, I guess to you, Mr. Williams—among the various remote sensing—go ahead.

Mr. WILLIAMS. I was just inquiring whether or not Dr. Bishop had any details with him about the Japanese instruments to try and help your understanding here, but we don't have.

Mr. NELSON. Dr. Henderson.

Dr. HENDERSON. Yes, sir. I'd like to make a comment, if I may, representing our user community.

The Geosat committee, which was formed 10 years ago focusing primarily on the geological applications of remote—sensing, encouraged the U.S. Government to add to the MSS these things that you are talking about that are now coming available through SPOT and through the Japanese systems. It speaks of frustration as you speak of the budget process. I can tell you that we have a great deal of frustration that we do not have these systems in the United States, for one reason or another.

From our community—and it's somewhat reflective, I think, of other user communities, though there are differences—it is the combination of these spectral bands on the MSS, on the thematic mapper, and hopefully, if the United States has the wisdom to develop a multispectral thermal infrared capability in advance of it coming from some other country, it is a combination of these spectral data with high resolution and stereo capability and in combination with global radar coverage, which we can't get in this country, which will ultimately serve our mapping needs the most efficiently.

It is a combination of these data sets that are important, not any one set of them more than the other. The combination of the French high resolution with the thematic mapper spectral band will be a great step forward.

If we can also combine global radar coverage with those, hopefully in the United States rather than from other non-U.S. data sources, which is not presently planned, this will increase our mapping capabilities, again, and it depends on what kind of targets you're looking for and what kind of mapping you're doing. This relates to resource mapping, it relates to engineering and environmental mapping, and it also relates to agriculture and timber in different degrees.

I would point out to you that the Japanese design, as I understand it, is designed specifically to acquire information on global resources for its resource requirements. It was designed, ground up, as a geological-first remote-sensing satellite system. We're sorry we couldn't do that in this country.

Mr. NELSON. Mr. Williams, on the combined system that Dr. Henderson is talking about that gives that valuable data, is there the market out there to purchase the data from that combined system?

Mr. WILLIAMS. The preliminary studies that Eosat did that I can quote were in 1984. At that point in time, we saw a great need for the combined data packages, and we did not pursue the market beyond that point, knowing that we would be unable to develop it in the near term—near term at that time, 5 to 10 years—because of the budget process in 1984, and the reduction at that time from a $500 million program to a $250 million program.

But the Japanese did continue their studies; ESA, as a space agency, did continue their studies also; and the Japanese came up with a profile which indicated to them that they could support 50 percent of their program—was the statement that was made to me—by the sale of data. So apparently they did see a very viable data market in combining data.

I'm afraid that's all I can quote from, from recent knowledge.

Mr. NELSON. OK.

Dr. Tilford, what does NASA have to do in the area of instrument research?

Dr. TILFORD. Well, I believe in each one of these particular areas that have been described we have long-range programs which will improve both the spectral and spatial resolutions.

In the case of the radar programs, we have an aircraft, the shuttle and hopefully moving towards the polar platform in the mid-1990's as a follow-on to the SEASAT Program on the one hand and then the SIR-A and SIR-B programs which have flown successfully on the shuttle.

We anticipate flying SIR-C, and we were flying an aircraft instrument until our CV-990 crashed in November of last year, we are rebuilding that instrument, which is a dual wavelength multiple polarization capability—and we hope to fly that instrument initially on the shuttle in 1990 and subsequently move towards flying a joint U.S.-European instrument (with three wavelengths—that is L band, C band, and X band—with multiple polarization) on the polar platform in the mid-1990's.

We also have plans to fly the kind of radar altimeters, that I believe that Fred is talking about, and we are in the process of discussing the potential of putting an upgraded version of the thermal instrument that we're now flying on an airplane with Eosat on

their Omnistar bus in the late 1980's well, early 1990's, I guess I should say.

Mr. NELSON. All right. You're talking long-term instrument research. They're talking short-term. What about short-term?

Dr. TILFORD. In the short term, we have no plans in terms—with the exception of the potential for the thermal channels—to fly anything on an operational basis.

We do have extensive plans for doing the long-term R&D in trying to understand what is the appropriate instrument to fly. In the case of synthetic aperture radar, for instance, we do not yet know what are the most effective combinations of wavelengths, polarization, et cetera.

Now we are talking about very, very large data rates, so it's simply impossible to take all this data down and keep it, and therefore we think that a very extensive R&D program is required in order for this kind of data to ever be used commercially on a viable basis.

We think that an extended R&D program is absolutely necessary in order to understand what are the products that will be useful for both R&D and for the commercial sector.

Mr. NELSON. And are you satisfied in the budget request in NASA that you're getting that?

Dr. TILFORD. You will be hearing more about that in subsequent months.

Mr. NELSON. And what does that mean?

Dr. TILFORD. That we're in the process of determining our fiscal year 1988 budget request at the current time. We're in the initial process for that, and we will be coming to you later this year.

Mr. NELSON. All right. Now what about your 1987 budget?

Dr. TILFORD. In our 1987 budget, we are carrying out most of these programs, some not to the degree that I personally would like but I think within a balanced agency program.

We have submitted the Topex initiative as a potential new start for 1987. We think in terms of many applications and scientific purposes this is the next significant step that needs to be taken, especially in the oceanographic community and also in the arena of air-sea coupling.

So we believe that we have a major initiative which we have submitted to Congress this year, and we're looking forward to the outcome on that particular new initiative.

Mr. NELSON. OK. Now in the mid-1990's, we're going to fly a polar platform that will be part of the space station although in different orbits, completely different orbits.

Now let me ask Dr. Bishop, will NOAA fly its instruments on both Omnistar and the polar platform?

Dr. BISHOP. I think the direct answer is, of course, no, sir, but there are things that need to be said in clarifying that.

We are very interested as an agency in the idea of a serviceable spacecraft on which to fly our major operational missions. Every analysis we've seen, although none of them are in the depth of detail that we'd like, indicate that there are enormous cost savings in that way of operating. I think our experiences with our appliances in our homes, in our automobiles, say that things that can be

repaired tend to last longer and give us some savings in how we do business.

So all of our intuition and all of our, indeed, preliminary analyses say that's the way we should go in the future, a serviceable spacecraft.

We frankly don't particularly care for our operational purposes what that serviceable spacecraft might be. We've expressed interest officially in a lot of forums in the polar platform of the space station era, and, as you are aware, sir, although we haven't submitted anything officially, we've been discussing inside the administration, using the Omnistar platform for that same purpose.

I think we're consistent in our interest, and we're researching all the possible paths.

Mr. NELSON. OK.

Yes. Don't worry. I haven't forgotten you, Dr. Bishop and Dr. Tilford, about your formal statements; we'll get to it. We just do things differently in this committee. We just sort of plunge in whenever we're ready.

All right. Mr. Williams, how have your actual revenues compared with your projected revenues?

Mr. WILLIAMS. We only have 10 months of operational revenues to discuss, but based upon the initial operation, the revenues at the present time are running less than the original projected plan.

I believe there are two basic causes to that. One is the transition process itself and trying to formulate and provide operating procedures for a commercial entity to deal with a whole host or variety of Government agencies, is a problem.

Another problem that we have seen, as you are well aware of, is the drop in the oil and gas industry. That has caused a reduction in the oil and gas industry of up to 75 percent of their R&D investment, but we do believe that that area of the oil and gas industry and that reduction of domestic sales is an area that can start to accelerate and can start to recover in the late 1986–87 time frame, because we believe that the oil companies should be investing more in research with a higher probability of capture, let's say, or probability of finding oil and gas rather than in distributing their R&D incomes over a larger base.

So we're going to try and accelerate that portion of our income by a different penetration method with the oil, mineral, and gas companies.

Mr. NELSON. Among the various remote-sensing advisory committees that already exist, does Eosat sit on any of them?

Mr. WILLIAMS. No, sir, we do not.

Mr. NELSON. All right. Do you believe that Eosat should have the right of first refusal for marketing all of the Government's experimental data sets?

Mr. WILLIAMS. The direct answer is yes. I believe that Eosatt could be or provide an appropriate conduit for getting the experimental data from the Federally funded experimenters to the user community.

I believe at the present time—I personally believe that the process is very expensive and cumbersome, and I think there are a number of recent examples, such as the large format camera, which tend to indicate that it's a very expensive process even when

you have a very small amount of data, to go through a completely competitive RFP method and not actually balance any portion of the return or investment by the Government.

So I think that Eosat could provide that conduit as an agent of the Government in order to provide a distribution and marketing capability.

Mr. NELSON. Does this kind of thing—is this competition to you that you don't like?

Mr. WILLIAMS. Yes, it is competition to us. I, of course, don't like any competition, but, by the same token, does it affect our direct market in the case of a large format camera? I don't believe it does. There are some claims that it does, but, by the same token, it's just one element.

If you look at a large number of elements, a wide variety of experimental data that's distributed by a wide variety of companies, you have not only a marketing problem as far as Landsat is concerned or the imagery perceived from Landsat is concerned, but you also have a regulation problem, a proliferation of companies in the field that would be very difficult to regulate and very difficult to control as far as the dissemination of data.

Mr. NELSON. Let me ask you about launching on a Titan. Has the DOD been responsive to you in your launch opportunities?

Mr. WILLIAMS. Yes, as far as launching on a CELV is concerned or Complementary Expendable Launch vehicle.

Mr. NELSON. Now called Titan IV, as of yesterday; we were just informed by the Air Force.

Mr. WILLIAMS. OK. We're up to Titan IV now.

We have participated with DOD in an exercise and also with the NOAA people in an exercise to determine whether or not we would be compatible with the now Titan IV vehicle, and the answer is yes, that we can launch on a CELV or Titan IV. We have that compatibility, we have gone through the orbital dynamics, and the initial conceptual mechanical work indicates that we can launch on a CELV or on the shuttle.

Mr. NELSON. What kind of price did you get from DOD?

Mr. WILLIAMS. The price that was given to NOAA, if Dr. Bishop will allow me—yes. Do you want to quote the exact language?

Dr. BISHOP. No, not exactly.

We have a quote from the Air Force of $171 million and $148 million, for an early launch and a later launch, respectively.

Mr. NELSON. Can you say those again?

Dr. BISHOP. $171 million and $148 million for an early launch and a later launch, respectively.

Mr. NELSON. OK.

Mr. WILLIAMS. I think there's one comment, Mr. Chairman, I'd like to make with respect to that.

Take into consideration that both of the prices include a cargo bay which is roughly 15 by 40 feet. Landsat or a combined Landsat/Metsat mission takes up less than—roughly 40 percent of the cargo bay, so it is a two-user launch, and one of the things that we are looking at is a launch of two satellites at the same time, not the launch of one satellite, on each of the quoted launches.

The commitment from the Air Force allowed two CELV's to be put aside and a time frame quoted and a price quoted to satisfy a

request from the administration. So there is a capability of someone else flying with the Landsat mission.

Mr. NELSON. Dr. Hendersen, let me get your views on the right of first refusal.

Mr. HENDERSON. I would say that our interest in that problem stems from two counts. In our community, we are interested in seeing whatever can be done to assure the continuity of the Eosat Program.

With that caveat, however—and we don't really know how this should be handled in the best interests of all.

As I've stated to you before, our prime interest is access to experimental data as well as, of course, all commercial data, which we will buy and pay for.

The problem of distributing experimental data and the question of our first refusal capability of Eosat bothers some of our members considerably in a philosophical point of view about creating anything in the law that would establish a monopolistic capability that might be abused in the future. If safeguards could be put into such a system, then perhaps it would be perfectly all right.

But I think if Congress is going to create an out and out monopoly, it should so state, and then we will deal with that on that basis. If it wants competition against the monopoly, then it also must protect that competition. I leave that in your hands, sir.

Mr. NELSON. Do you see a difference between the R&D needs of the Government and the R&D needs of the private sector?

Mr. HENDERSON. Certainly. I think there is always going to be a different role for Government R&D and for the private sector R&D.

As I understand it, in our experience over recent years, there's no question of the support from our community for continued basic science and research that is conducted by NASA. They are far and above the obvious and right people to do the kind of research that our industry never can or—I shouldn't say "never," but can't do under the current circumstances and wouldn't be doing for some time in this field.

Our interest continues to be, as we have worked with NASA and will work with anybody who wants to work in terms of developing joint applications type demonstration projects, et cetera, to help develop use of the technology so we can better understand how to use it and so people we're providing the data can better understand how to use it, like Eosat, or how to market it, and also to help support the justification for continued basic science as is currently being conducted.

So there are different roles, and we think they should be, however, dealt with in a cooperative and interactive manner, if possible.

Mr. NELSON. All right. From your perspective in Geosat, is the U.S. leadership in land remote sensing still safe, and, if so, how long?

Mr. HENDERSON. Still safe. I have to answer that question, no, it is not safe. We view what is happening with respect to the Eosat process with some concern. We certainly can see where, if it doesn't get sufficient money to complete its contract and other things, it might be in a situation where it might not be able to perform. Obviously, that is not in our interests.

We, in our community, will buy data from any source we can get it at, and it is a strong feeling on our part that the complementary systems built around the world are going to develop and that the open skies concept is critical to access to that data.

Mr. NELSON. And the what?

Mr. HENDERSON. Open skies policy is critical to the access to that data.

If, for example, the yet to be determined decision by the Japanese Government on data dissemination from their Earth satellite were to go against the open skies policy, it would change our concerns about the validity of that policy and what we ought to do about it.

We are being challenged, we need to support the U.S. role in this thing, and I would say it's unsafe at the present time.

Mr. NELSON. All right. Now why do you think that the Office of Management and Budget has consistently opposed commercialization of land remote sensing?

Mr. HENDERSON. Mr. Chairman, I can't honestly understand that answer. It's been puzzling me for 10 years.

We have worked repetitively to try to encourage the development of such a thing, for example, as Stereosat during the Carter administration, to give the United States, and the world, for that matter, high resolution stereo capability to precede the SPOT system. We don't have it, and a factor in that was the OMB efforts to kill that effort to develop a Stereosat Program. I don't know that they were the total reason; they, of course, were probably not.

There are other reasons—the lack of the existence of a Landsat Act which now occurs where business could actually find a mechanism for supporting such a system—but, in my experience, they have repetitively cut every program that we think the United States ought to have or served as an impediment to that development, and I don't know why.

Mr. NELSON. It is disturbing, isn't it?

Mr. HENDERSON. I don't know how we can elect them out of office.

Mr. NELSON. Dr. Bishop, I know you don't want me to ask you this question, and tell Dr. Calio, when he comes in front of the committee, that I'm going to ask him this, too. But I want to know what has OMB told you about what should be the commercialization of land remote sensing?

Dr. BISHOP. Mr. Chairman, I do not purport to speak for OMB directly.

Mr. NELSON. No, that's not what I asked. I asked what they had told you and Dr. Calio.

Dr. BISHOP. Yes, sir.

The decision is made strictly, sir, as I understand it, on a matter of budget, trying to reduce the deficit.

Mr. NELSON. Is this what they have told you now? That's what I asked.

Dr. BISHOP. Yes, sir.

Mr. NELSON. OK. Go ahead.

Dr. BISHOP. I haven't much more to add to that, except that also in the exchange between OMB and us on the budget that was presented to the Congress; we said that it was time to let those who

benefited in the private sector pick up the cost of establishing the system, the subsidy.

Mr. NELSON. Dr. Tilford, the same question.

Dr. TILFORD. Unfortunately, I am unable to answer that question because, since the operational aspects of Landsat has been transferred from NASA to NOAA, we do not deal with the Office of Management and Budget regarding the operation of land remote-sensing systems. So I have no information whatsoever, and I don't believe OMB and NASA have had any dialog on that particular subject.

Mr. NELSON. You don't think I'm going to let you get off that easy, do you?

Dr. TILFORD. No, sir.

Mr. NELSON. All right. Since you can't answer the question, what they have told you? you can certainly answer the question, why do you think that OMB has consistently opposed the commercialization of land remote sensing?

Dr. TILFORD. I guess I would disagree in your assumption in the sense that I am not sure that OMB does oppose the commercialization of the Landsat system. I truly believe that OMB endorses the commercialization of the Landsat system. I believe it's the mechanism that we're discussing and the amount of money that's involved, and I don't believe that OMB opposes the commercialization of Landsat.

I do believe that OMB are looking for funds to cut from all areas of the budget, and I believe, personally, that they have selected this as something that, if it is commercially viable, it should survive on its own.

Mr. NELSON. It would seem that OMB really was undercutting the basic philosophy of President Reagan, which is to encourage commercialization—in this particular case, the private sector—in a new venture in space, and yet we have seen time after time this is just—you know, it's not being encouraged there.

Dr. TILFORD. Sir, as an Earth scientist and one who wants to utilize land remote sensing for long-term research into global change, as was recently recommended by the Earth Systems Science Committee, I think, in terms of a viable contribution and maintaining the forefront, as you have described, in remote sensing, we do have grave concerns about the demise of U.S.-provided U.S. availability of land remote-sensing data, especially for the long-term research programs within the agency.

The recommendations of the Earth Systems Science Committee have indicated that in order to better understand long-term climate changes and be able to predict these changes, to understand the impacts of deforestation, the potential for drought, desertification, et cetera, it is absolutely necessary to have global data sets on a long-term basis.

Anything that impacts that, I think, will have negative impacts to our ability to predict in the future what nature is doing on the one hand but, more importantly, what man is doing on top of nature in terms of the long-term habitability of this planet.

As a scientist, I have very serious questions that, if such an entity does not exist, then we are not going to make very much headway in the future in understanding how the planet works.

Mr. NELSON. As a matter of fact, as you were saying that, I was thinking that on STS-61C we got some excellent photography of some of the deforestation in South America, particularly around the Amazon region, where that activity is going on, and that's just another data set, as you were talking about, to help us understand what's going on.

Dr. TILFORD. It's important to have these kinds of data available on a continuing basis in order to understand what the changes are to start with. That's fundamental.

Mr. NELSON. Dr. Smith has pointed out, we need to get for the record, when is the combined NASA and NOAA R&D plan going to be submitted here?

Dr. TILFORD. Mr. Chairman, could I defer to my colleague on the other end of the table?

Mr. NELSON. Sure, and you all can even consult, if you would like.

Dr. TILFORD. I don't believe that's necessary.

Dr. BISHOP. Mr. Chairman, the booklet to which you're referring has been through a number of reviews inside the Administration. It is in its final review. We've found in the last few days some errata that need to be incorporated into it, and I suspect it's a matter of days, not weeks, until we can submit that to you.

Mr. NELSON. OK. Now how has OMB been affecting this plan?

Dr. BISHOP. I have to say in a fairly minimal manner, sir. They have allowed us some discretion in putting the plan together, and in fact probably the largest impact came from you and your colleagues who told us that they didn't like the first draft that they saw, and that we needed to do some more work. We've done that additional work, perhaps not totally to your satisfaction, but we've made an attempt, and I think we're in the last rounds of that review, and we have caught a few errors that we need to correct.

Mr. NELSON. OK. Now, Dr. Tilford and Dr. Bishop, your statements will be made a part of the record. Let me give you this opportunity to go ahead and state anything that you would like to state for the record, and then we'll get on into some more specific questions to the two of you.

Dr. TILFORD. Thank you, Mr. Chairman.

I'm very pleased to see the desire of this committee to act with the technical amendments that are proposed. We fully support the majority of the changes and believe they make significant headway in terms of correcting some of the deficiencies that we've described earlier.

There are a few of the proposed changes which I would like to comment on in detail.

We at NASA do not support an additional advisory committee. We believe that we have a very large number of committees which we interact with and support, and we have some suggestions, and I'll go through those.

We concur with the concept of an advisory group. We are concerned, however, that too much authority is being proposed to be given to this particular advisory committee.

To require that the Government must always consult with a specific committee regarding its remote-sensing and development programs, including cooperative projects, may have a detrimental

effect on the ability of the U.S. Government to maintain its leadership in remote-sensing technology.

In addition, one can certainly envision numerous situations in which the R&D needs of the Government may not be the same as the R&D needs of the user/seller community. I think your colleague, Mr. Walker, pointed out a number of these this morning.

NASA receives advice currently from the National Academy of Sciences, the National Research Council, and their internal NASA advisory committees, plus additional committees such as the Earth Systems Science Committee. Each of these advisory groups have different priorities for achieving the goals and objectives of the national and NASA remote-sensing programs. These sometimes differ because of conflicting objectives of each of these different communities. As a result, we get conflicting recommendations.

We have again suggested that the National Academy of Sciences Space Application Board, perhaps with some modifications to its current composition, could accept the responsibility and fulfill the requirements desired for this committee. We believe that the Board already has a charter which is compatible with the objectives stated in the proposed legislation. Therefore, we recommend that section 7 of the proposed amendments either be modified or deleted.

We concur with the intent of the amended section 502 to make sure——

Mr. NELSON. Let me stop you right there——

Dr. TILFORD. Yes, sir.

Mr. NELSON [continuing]. And just ask you. I know what you say, and I know what you wrote, and there's a little bit of variation, at least the way I interpret it. What you wrote seems to suggest that if the advisory committee were placed in the Space Applications Board it would be OK.

Dr. TILFORD. Yes, sir; I stated initially that we oppose an additional advisory committee. We do not oppose the concept of the National Remote-Sensing Advisory Committee, the concept, but an additional committee is one more committee which we have to deal with and one more additional voice that has to be heard.

What I'm suggesting is that I believe the space science application—I'm sorry—the National Academy of Sciences Space Application Board has a charter which is equivalent to what you are proposing already.

Mr. NELSON. OK. Please go on.

Dr. TILFORD. Thank you.

Although we concur with the intent of the amended section 502 to make sure that the Government does not compete with the private sector, we believe it may also prevent the experimental research and development required to make sure that the United States remains in the forefront in this very important area of space remote sensing.

We believe that many kinds of data gathered in experimental remote-sensing space programs can, will, and should compete in the research and development sector but not necessarily in the commercial sector. We believe that's the only way that some of the long-term things we don't even know about now can come to pass.

Therefore, if they do not compete, then certainly we're going to have outdated systems in the very near future.

Mr. NELSON. I might say that we don't intend that this section 502 amendment will affect your ability in NASA to distribute data for R&D purposes. It establishes a private sector entity to distribute the data for commercial purposes, and so if there's any ambiguity there, we need to clear that up, and we'll do so in report language.

Dr. TILFORD. We would suggest and appreciate that very much. I think that's an appropriate solution.

Mr. NELSON. All right.

Dr. TILFORD. In terms of section 504, we believe that should be expanded, because of Martel, to include private sector entities and any other cases in which a marketing organization, not simply a remote-sensing systems operator, might be providing data for potential R&D purposes, and we suggest perhaps that that could be corrected.

We believe that section 603 should be further modified. We're still concerned, as we were in the original legislation, that if interpreted literally this provision can prevent reproduction of remote sensing data for use by coinvestigators under the federally funded principal investigator proposal, where two principal investigators fund the same program within a given agency.

Mr. NELSON. All right. Hold on one second there.

Dr. TILFORD. Yes, sir.

Mr. NELSON. Mr. Williams, do you want to comment on that—on the 603 thing?

Mr. WILLIAMS. No, sir; I'd like to take that as a separate subject, if you don't mind. I don't believe I'd like to comment yet, until I absorb what Dr. Tilford has to say on the rest of his testimony.

Thank you.

Dr. TILFORD. I think that concludes. Again, I would like to reiterate, we believe these modifications go a long way toward improving the legislation. We commend you and your staffs on the speed and completeness with which you address these, and I'll be happy to answer any questions you might have.

[The prepared statement of Dr. Tilford follows:]

Hold for Release Until
Presented by Witness

Statement of
Dr. Shelby G. Tilford
Director, Earth Science and Applications Division
Office of Space Science and Applications

National Aeronautics and Space Adminstration

Before the

Subcommittee on Space Science and Applications
Committee on Science and Technology
House of Representatives

Mr. Chairman and members of the Subcommittee: I am pleased to appear here today to testify before this Subcommittee on the proposal to amend the Land Remote-Sensing Commercialization Act of 1984.

We are very pleased to see the desire of this Committee to make technical amendments to this legislation, which we think will improve the relationship between the Government and the commercial sector. We fully support the majority of the proposed changes and we believe that such changes remedy many of the deficiencies that were discussed before the Senate Subcommittee on Science, Technology and Space of the Committee on Commerce, Science and Transportation in November of last year. However, there are some proposed changes in these proposed Amendments about which NASA would like to provide comments.

We do not support the establishment of an additional Advisory committee. Although we concur with the concept of an an advisory group, we are concerned that too much authority is proposed to be given to this Advisory committee. To require that the government must always consult with this committee regarding its remote-sensing research and development (R&D) programs, including cooperative projects, may have a detrimental effect on the ability of the U.S. Government to maintain its leadership in remote-sensing technology. In addition, one can certainly envision numerous situations in which the R&D needs of the government may not be the same as the R&D needs of the user/seller community. NASA also receives advice from the

National Academy of Sciences/National Research Council and our internal NASA Advisory Committees. Each of these advisory groups has different priorties for achieving the goals and objectives of the national and NASA remote-sensing programs which sometimes results in conflicting recommendations from these different communities.

We suggest that the National Academy of Sciences Space Applications Board (SAB), perhaps with some modifications to its composition, could accept the responsibility and fulfill the requirements desired for this Committee. We believe that this Board already has a charter which is compatible with the objectives stated in the proposed legislation. We recommend that section 7 be deleted from the Bill.

Although we concur with the intent of the amended section 502 to make sure that the government does not compete with the private sector, it may also prevent the experimental research and development required to make sure that the United States remains in the forefront in this very important area of space remote-sensing. We believe that many kinds of data gathered in experimental remote-sensing space programs can, will, and should compete in the research and development sector, but not in the commercial sector.

Our major concern is that this proposed wording may be interpreted to mean that no research can be performed on Federally funded experimental remotely-sensed data, even in a Federally funded research project, until after the data is first sold 'en bloc' and then subsequently repurchased from a commercial vendor for research purposes. Such an interpretation could be devastating to the Earth Science research community and greatly increase the cost to NASA associated with the competitive 'en bloc' sales envisioned in section 503. Therefore, we would like to request report language that would insure researchers seeking to obtain experimentaly remotely-sensed data will not be denied the opportunity to receive this data because of any ambiguity concerning the need or timing of competitive 'en bloc' sales.

We believe that section 504 should be expanded to include private sector entities, in addition to system operators, which obtain the right to market experimental remote-sensing data under section 503 for those entities which would like to market data but are not system operators.

We believe that the wording of section 603 should be further modified. We are still concerned, as we were with the original legislation, that if interpreted literally, this provision can prevent reproduction of remote-sensing data for use by a co-investigator under a Federally funded principal investigator proposal or two principal investigators funded by the same program within a given Federal agency (i.e., that data for a single investigation might have to be purchased separately for

each individual working on a given research project). This wording may also prove ambiguous with multiple investigator use of common computer databases.

I would like to reiterate that we believe these modifications go a long way toward improving the legislation and we commend you and your staffs on the speed and completeness with which you have addressed the concerns stated in the earlier hearings.

Mr. Chairman, thank you very much. I will be happy to answer any questions.

Mr. NELSON. OK. Let me go back to your 504 comments. You said—am I correct?—that the 504, any entity who wins the marketing rights to the R&D data—would that put both the Government and the private sector entity distributing the same data for R&D purposes? What was your comment there?

Dr. TILFORD. It could or could not. The main concern is that the subsections 1, 2, and 3 apply to anyone that markets data for federally-funded R&D activities, and that's my concern, that the section 504, as currently written, simply does not address that question. It says any system operator under titles II, III, or IV of this act, but it limits it to system operators. So I believe that is a deficiency in section 504 as now written.

Mr. NELSON. What could the private sector entity do that the Government couldn't do?

Dr. TILFORD. Well, I think you have to go back to section 502 as now written; 502 states—if I may quote:

> Each Federal agency is authorized and encouraged to provide data gathering experimental remote-sensing programs to related R&D programs funded by the Federal Government, including applications programs, and to cooperative research programs if the Federal agency involved determines that the data will not be used, one, for any commercial purpose, or, two, in substantial competition with data available from a licensee under this act, except pursuant to 503.

What that says essentially then is, any data that is potentially in competition with the kind of data we're talking about could be prevented from being made available for R&D purposes without first having to be sold en bloc and then purchased back.

Therefore, that would limit, as you indicated, the Federal Government from distributing data at the same time that the marketeer distributes data.

I personally would not object to the marketeer, or, in this case, Eosat, distributing all the data, both from R&D and for commercial sectors, provided that the constraint is that we do not preclude the R&D community having access to the data.

Mr. NELSON. Dr. Smith.

Dr. SMITH. I just wanted to maybe compare that concept. Basically, you're saying that you want to make sure that the public has rapid—you want to facilitate the access of the public to R&D data. I just wanted to compare that concept with the principal investigator policy that NASA currently has for the public access to R&D data as opposed to the principal investigator's access to R&D data.

Dr. TILFORD. Yes. Let me briefly review the process that we had to go through with the large format camera and the subsequent delay in making that data available to other people other than the federally funded R&D'ers, in this case, perhaps members of Fred Henderson's organization.

As currently written, having to go through an SEB-RFP process of making every set of experimental data available on a case-to-case basis to en bloc sales, we have to go through a typical procurement sales process which requires a minimum of 2 to 6 months. We believe this delays for that same length of time this data being made available to the public in a way that they might want to do R&D type processing evaluation, et cetera.

I believe that Dr. Henderson might like to comment on this also.

Dr. SMITH. Wait a minute. Let me just see if I clarified my question. That 6 months, how does that compare with the principal investigator's right to have exclusive use of that data prior to release to anyone else?

Dr. TILFORD. Well, currently, with many R&D programs, as you know, the principal investigator proposes, through an announcement of opportunity process, and they have exclusive data rights to that data for a period of 1 year to 18 months.

We have been discussing with a number of people, including the Geosat committee, that in many of the potential application areas, that we feel that a certain fixed, predetermined, set amount of all R&D remote-sensing data should be made available to the general public, that the locations and the amount of the data be announced, such that that community could have access to the data essentially in the same time frame that the principal investigators could, and we would set that aside ahead of time.

As worded now, the legislation would prevent a cooperative research program of that kind being implemented.

Mr. HENDERSON. I basically concur with what Dr. Tilford just said. That has been our concern all along, is access to experimental data on some reasonable basis.

We in no way wish to use that access in what has been defined in the past as a competitive or commercial manner, although it has been our need to have access to the data to try it out in the way we would use it if we ever wanted to buy it, and we have no desire whatsoever to jeopardize the principal investigator program, we simply want access to some form of that data.

For example, many of our companies simply cannot or have not been able to acquire SIR-B data, and to not allow them to have a chance to try it out does not make sense to me if this data ultimately is ever to be transferred to the public sector either through some mechanism such as Eosat or whatever, and I certainly concur with everybody's concern about the delays in costs associated with the process of the en bloc sales and refer back—and maybe the large format camera effort was not exactly an ideal test case of this process, but would refer back to Dr. Tilford's testimony in the Senate, where he stated clearly that nobody bidding ever had a chance to try out the data to see if they wanted to bid in the first place. So that doesn't seem to make sense to me at all.

Mr. NELSON. Dr. Smith.

Dr. SMITH. I might suggest that one thing that I don't think is precluded by the act so far—and we really haven't changed this—is that you could hold a competition for those bidding rights which covers not each individual set of data that comes out but for some period of time—2 years, 3 years—and thus streamline that process significantly.

Dr. TILFORD. That's certainly possible, but I also believe that the suggestion, since we, in reality, have designated Eosat almost as a unique organization in the sale of much remote-sensing data, that if they were so designated for the duration of their current contract with the capability of right of first refusal, then that data could be made available instantaneously to any portion of the public on a nondiscriminatory basis.

Mr. NELSON. Are you through with your comments now overall?

Dr. TILFORD. Yes, thank you.

Mr. NELSON. All right. Let me ask you about section 503. You want to minimize the cost of procurement. What would be the effect of holding a competition to award the marketing rights for a certain period of time, say, three years, rather than for each data set?

Dr. TILFORD. Depending upon how it might be implemented.

As currently written, the legislation says that such data could not be made available except through en bloc sales. Therefore, this would mean for this 3-year period, from the time we obtained the data until we went through one of the 3-year periods, that we would not be able to make this data available, number one, on a commercial basis but, number two, for the kind of thing that Fred Henderson has indicated in terms of looking at what use the data might be except through some change in NASA's announcement of opportunity process. That is certainly a possibility, but it will, again, have to go through a competitive evaluation process, which does take an extended period of time.

One of the problems in terms of the AO process, in the case of R&D purposes it's straightforward—you propose what particular area you want to look at, and then you go analyze that data for that particular area.

In many cases, you want to look at a number of areas that have been obtained, and you only know those after the fact. So I think it does complicate it in terms of potential commercial utilization for a period of time if we only hold such competition every 3 years or so.

Mr. NELSON. Do you want to clarify?

Dr. SMITH. I just want to emphasize something that Chairman Nelson said earlier, that we certainly don't intend that the new wording inhibit the distribution of R&D data. Indeed, we see those two paths as completely independent. The procurement relates only to the distribution of data for commercial purposes, and we'll make clear in the report language that NASA has the same abilities it has always had to distribute R&D data consistent with its existing——

Dr. TILFORD. That will rectify most of my concerns.

Mr. HENDERSON. Mr. Chairman.

Mr. NELSON. Yes, sir.

Mr. HENDERSON. May I just add to Dr. Smith's comments, as I have to him before, I don't know how you do it, but I do think some clarification of what you mean by "commercial purposes" is important. I don't know whether it should be a legislative definition, but somewhere we all need to understand what that means, because it certainly has been misunderstood by everybody up to the present, as far as I'm concerned.

Mr. NELSON. OK. Mr. Bishop, let's have your comments, and then I've got a couple of questions for you.

Dr. BISHOP. Thank you, Mr. Chairman.

I am pleased to be here today, and I have enjoyed your technique of plunging into the conversation.

Mr. NELSON. We're sort of uninhibited by rules and regulations. We just try to sort of get right to it.

Dr. BISHOP. Thank you, sir. That's good.

As you noted at the outset, Dr. Calio had intended to be here until late last night. He did ask me to extend both his personal regards and his regrets for not being able to be here.

Your technique of plunging right in has preempted some of the comments that I might have made. Let me say that we're here to talk about some changes to the Landsat Remote-Sensing Commercialization Act of 1984, which is something that I've considered a rather remarkable piece of legislation in both its completeness and its appropriateness for the job it set out to do.

In our prepared testimony, we've reviewed some of the progress we've made under the various titles. You have probed the progress we have made in the commercialization part in titles II and III, and so I'll not say anything more about that.

I would note, though, that in a couple of the other titles we've made some progress as well. In title IV, which is licensing, we have issued draft regulations; we have comments on those, and we'll soon be sending them through final administration approval; and we've issued one license to ITEK for the large format camera.

You have also probed title V, and particularly the R&D report, I'll not try to add anything to that. In title VI, the National Archive and the basic data set was spelled out as something we should pay attention to. We've come to an agreement with the U.S. Geological Survey that that National Archive will be placed at the Eros Data Center in Sioux Falls, SD, and we have begun our planning for that. So we've made some progress, I think, in all the titles under the original act.

With that, let me make a few comments on the changes that you're proposing to the act.

As the other testimonies have said, we find that the additions that clarify the use of data in R&D and the use of R&D data quite helpful and, beyond that, have no particular comments to add on that subject.

The two things we do wish to comment on, however, are in sections 5 and 7; in particular, the disposition of the assets in section 5, and the advisory committee in section 7 of your proposed changes.

We find the idea of allowing the Secretary to dispose of the assets at the end of the contract period a very useful one. We were, I'll use the word "trapped"—perhaps that's too strong, but we were constrained (by the fact that we used the Government procurement process to do the commercialization) that we, the Government, end up owning the assets. Allowing the Secretary to dispose of them in an appropriate manner, we think, is an excellent idea and we highly approve of that particular change.

We have two minor comments, though, to place on the record. First of all, we think you ought to specify that these be Government [DOC] assets. I don't think the Secretary should be allowed to dispose Eosat's private assets or something else, but just particularly the DOC assets.

Mr. NELSON. This says, "dispose of any Government assets."

Mr. TILFORD. If I might comment, I would recommend that you might want to put "Department of Commerce assets," because there are potentially a number of assets that NASA is still using

for R&D purposes that is currently included in this wording which might not be appropriate at a particular time.

Mr. NELSON. OK. We can take care of that in the report language.

Dr. BISHOP. Surely.

Mr. NELSON. Go ahead, Dr. Bishop.

Dr. BISHOP. The other thing is that we feel that the constraint you place on the Secretary by the language—and I think I'm quoting—"in a manner that best assures the continuing contractor's commercial activity" may be a little too constraining.

One can envision some scenarios in the future where the program should continue but where the contractor, Eosat, may not be the remaining entity. We might want to allow the Secretary the flexibility to dispose of the assets by other standards than the continuation of the contractor's commercial activity.

Mr. NELSON. Go ahead, Dr. Smith.

Mr. SMITH. On that, it might to help to clarify. How would you reimburse the private sector party who originally invested in parts of those assets if you disposed of that to some third party?

Dr. BISHOP. Well, if we're only disposing of the Government assets, I don't think that's a problem.

Mr. SMITH. The original concept was that, since Eosat and NOAA had jointly funded some of the capital equipment, it made sense that some of that would go back to Eosat, and we wanted to streamline Commerce's ability to do that.

Now if Eosat is not the entity that you're going to dispose that to, how would you reimburse Eosat?

Dr. BISHOP. I'm not sure that I understand, since we've agreed that we'll only dispose of the Government assets, and because of a contract we have to keep some kind of an accounting.

Let me take, for example, the ground system, where we know that there will be some joint investment. We have to keep an accounting of what we own and what we don't. I don't think that's a complication.

Mr. SMITH. OK. There are probably some pieces of equipment that mechanically you would have to make a determination that part of the Eosat investment has to be reimbursed if you're going to dispose of it to someone else.

Dr. BISHOP. That's possible. Perhaps in your report language you can instruct us accordingly. But, in any case, we're proposing that you consider dropping that constraint on the Secretary's actions.

Mr. NELSON. OK. You've got some comments on section 7.

Dr. BISHOP. Yes. On section 7, as you know, Mr. Chairman, Dr. Calio does not like the idea of an additional advisory committee, and our very strong opinion is that it be removed from the changes in the act.

I must say that I concur for a lot of the same reasons that Dr. Tilford has said already and that you have in our written testimony—namely, that there are a number of existing advisory committees that give us advice, and they're along the same lines.

Mr. NELSON. Let me stop you right there and ask, having said that, that there are a number of advisory committees, and therefore you think that this would be an unnecessary addition, can any

of those current advisory committees provide an independent source of advice?

Dr. BISHOP. I think any of the National Academy committees, sir, can give an independent source of advice.

In any case, any advisory committee that a Government agency sets up will be supported financially by that agency, and the National Academy has built a very careful line that protects their independence even though the support comes from a Federal agency. The same, of course, would have to be true of an advisory committee that we set up based on your legislation.

Let me just add, pursuing that just a little bit, that you give three reasons for such an advisory committee. The first of those is to make a voice for the users; there are lots of mechanisms for giving a voice to the users, and they're tried and true mechanisms—workshops, symposia, special events, and of course, the existing advisory committees. The users also have a vote through the open market as long as we have a commercial endeavor.

The second point that you make is that there's a need to determine what's of commercial value in R&D data, or advise the agencies on what's of commercial value in the R&D data.

I found that a bit puzzling. This is a personal view, I must add. I found that a bit puzzling, because if I wanted to—I'll use a homely example—test the marketability of a new transmission, I don't think I'd come to a driver necessarily; I would go to somebody like one of the major automotive companies and ask them to do a market survey.

Given that, if I wanted the kind of advice you call for here, I think I would go to a very small handful of places, including Ecsat, SPOT, and ITEK, as the only three companies who have announced their intention to be a commercial endeavor and ask them what the market says. They will have the skills in place to test the market. I might do a few independent checks, but I doubt if I would go to a group of experts on an advisory committee to ask what had commercial value. I think I'd go to the commercial marketplace.

The final thing called for in your legislation is a need to lay out cooperative test programs of several kinds; and the word "cooperative" there says to me that there is financial support provided by the several parties to that cooperation.

If that's the case, then I think those who are willing to support it financially probably are the only ones who ought to have a significant vote in what those cooperative test programs are, and I don't think I'd go to an advisory committee for that particular set of advice.

Due to all of these things, the advisory committee part of your changes in the legislation is something that we do not support.

Mr. NELSON. Can any of the existing advisory committees provide continuity and advice rather than the ad hoc advice?

Dr. BISHOP. Well, a number of the National Academy committees, as well as several of the committees within the Federal Government, like the NASA Advisory Councils—which, although they are part of NASA's structure, are independent—and the Committee on Oceans and Atmospheres within FCCSET—all of those are standing committees that have been around a long time. The Space

Applications Board at the National Academy has been with us since the 1960's, I believe, or the 1970's. That seems the sort of continuity that has extended at least for a couple of decades now.

Mr. NELSON. Are any of those advisory committees a forum for private sector users?

Dr. BISHOP. Well, we can argue about the composition of any of the committees, but, indeed, when I go to the committees at the National Academy, I see people from all manner of private firms, from aerospace firms, from value-added companies, and from a number of firms that are almost end-product users.

So, yes; I think the representation can be made adequate in almost any of the existing committees if we have the intent to do that.

Mr. NELSON. How about any of those advisory committees providing a forum in which to judge whether the experimental data is competitive with existing satellite operators?

Dr. BISHOP. That's what I meant to address when I talked about commercial value.

I believe, sir, that the place to ask about commercial value and whether it's competitive is in that marketplace, not with a set of independent experts who are assembled because of their substantive expertise. I would go to the marketeers, and so I would go to the handful of companies who know the market.

Mr. NELSON. You see, our concern is that there's not any one advisory committee that combines all the features of an independent source of advice, continuity, a forum for the private sector, and a mechanism for judging experimental data.

Dr. BISHOP. Well, sir, I believe that the existing committees handle the first three, and, as I just said, I think the fourth of those, the marketability of the data, or the competitiveness, or the commercial value—however you wish to term it—is something that the marketplace and those who are involved with the marketplace ought to judge.

Mr. NELSON. Well, let me ask you—you're concerned, and I know Dr. Calio is also, with the proliferation of these advisory committees. Do you think that you have the authority to combine any of those existing ones?

Dr. BISHOP. I'll have to leave it to Dr. Tilford to talk about the NASA advisory apparatus. No, sir, we don't have the authority to combine the National Academy committees. We do have, not the authority, but certainly the wherewithal to commission the right kind of studies using the National Academy mechanism. We also have, in this case, I guess, within the administration although not entirely within the Department of Commerce, the authority to direct the standing committees within the Government, like the Committee on Oceans and Atmospheres, to do an appropriate study for that part of the work.

Mr. NELSON. OK. We will continue to deliberate on this issue.

Go ahead. Do you have any further comments?

Dr. BISHOP. No, sir. That concludes my comments.

[The prepared statement of Dr. Bishop follows:]

TESTIMONY OF

WILLIAM P. BISHOP

ACTING ASSISTANT ADMINISTRATOR

NATIONAL ENVIRONMENTAL SATELLITE, DATA AND INFORMATION SERVICE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

U.S. DEPARTMENT OF COMMERCE

BEFORE THE

SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS
COMMITTEE ON SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

JULY 18, 1986

Mr. Chairman and Members of the Subcommittee:

I appreciate the opportunity to appear before you today to present the Administration's position on H.R. 4932, the Land Remote-Sensing Commercialization Act Amendments of 1986. Approximately two years have passed since the signing of the Landsat Act, and one year since we began work on the commercialization contract with EOSAT. During this time, we have been guided and directed by the Act. We feel that there are several minor technical corrections and amendments which would improve the Act, and these are included in H.R. 4932. I would like to take this opportunity before my comments on H.R. 4932 to briefly summarize the progress that has been made since the signing of the Act.

SUMMARY OF STATUS OF COMMERCIALIZATION

We signed the commercialization contract on September 27, 1985, and work on implementing both Titles II and III was initiated at that time. During the past nine months,

EOSAT has taken over the marketing of Landsat data, and the day-to-day operation of the Landsat 4/5 system. Although there was a period of slow sales for four months, probably due to the transition process itself, EOSAT expects to increase sales substantially over the next several quarters. Performance at projected levels will provide a financial position that will ensure long-term continuation of the private sector remote-sensing business. The spacecraft, sensors, and ground system that are so vital to EOSAT's success during the Landsat 4/5 period continue to perform at or above technical specifications.

The President's FY 87 budget recommends that no further government subsidies be provided for Landsat because this program primarily benefits private interests. We expect that the commercialization of Landsat will be continued with private sector funding, and that these technical amendments will promote that effort.

We have also made considerable progress on the other Titles of the Act. Under Title IV, "Licensing," we have issued a license for one private sector remote-sensing system, the ITEK Large Format Camera activities on future Space Shuttle missions, and we have completed our regulations to implement Title IV activities. These proposed regulations have been released for public comment and in final

Administration review at this time. As required under Title V, "Research and Development," NOAA and NASA will soon transmit to the Congress the first joint report, entitled "Space-Based Remote Sensing of the Earth and its Atmosphere." Also, I feel that the report, "Earth System Science," recently released by the Earth System Science Committee of the NASA Advisory Council, will provide an outstanding guide not only for remote-sensing, but also for data access, ocean studies and atmospheric sciences. NOAA, NASA, and the application agencies, such as USDA, DoI and EPA, are continuing their R&D activities. Under Title VI, "General Provisions," we are moving forward with plans and procedures for the land remote-sensing data archive and basic data set. The archive will be located at the EROS Data Center, in Sioux Falls, South Dakota, and staff from each of the above-named agencies are jointly developing the implementation plans.

SPECIFIC COMMENTS ON H.R. 4932

H.R. 4932 would make technical and clarifying amendments to the Landsat Act. In general, we believe these amendments represent useful additions to the Landsat Act and will allow us to address issues which have developed during its implementation. The Department would be affected primarily by sections 5 and 7 of the bill, and so my comments will address those sections. Section 5 of H.R. 4932 would amend section 308 of the Landsat Act to authorize the Secretary of Commerce to

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dispose of the capital assets at the end of the contract period in a manner which he feels will best ensure the continuation of the contractor's commercial activity. At the time of enactment, section 304(a)(6) of the Act did not contemplate that the Government would obtain title to the assets, and therefore did not address the issue of the disposition of the assets at the end of the contract period. As written, the contract provides that EOSAT will deliver in place and the Government will accept the spacecraft and ground support equipment. The contractor will have possession and control for the life of the contract to satisfy the requirement of data continuity. The Secretary should have authority to dispose of these assets, if appropriate, at the end of the contract period. However, we recommend two amendments to this section. First, as drafted, the Secretary would be authorized to dispose of any Government assets. We believe the authority should be limited to any Department of Commerce assets. Second, the condition that the assets should be disposed of "in a manner which best ensures the continuation of the contractor's commercial activity" is too limiting of the Secretary's discretion. We recommend that the phrase be deleted. With these changes, we could support section 5.

Section 7 would establish a National Remote-Sensing Committee comprised of representatives of remote-sensing data users, data vendors, technology developers, system operators,

system developers, and data processors from the Government and the private sector. The Committee would be responsible for providing advice and policy recommendations to NASA and DOC on the development of the national plan for remote-sensing R&D, which is required under the Act; providing recommendations to Federal agencies sponsoring research programs on the commercial value of certain experimental data sets; and providing recommendations on the conduct of cooperative test and applications demonstration projects.

We oppose the establishment of another advisory committee addressing the remote-sensing R&D area. We believe this committee would be an unnecessary addition to an already large number of Federal advisory committees. At the present time, there are numerous committees charged with providing NOAA and NASA with advice and policy recommendations in the area of remote-sensing. These committees include the Space Applications Board, the Earth Science Board, the Ocean Science Board, and the Board on Atmospheric Sciences and Climate of the National Academy of Sciences; the Space Science and Applications Committee and the Earth System Sciences Committee of the NASA Advisory Committees; and the Committee on Oceans and Atmosphere of the Federal Coordinating Council on Science, Engineering and Technology. All address issues and policy in the same area that would be covered by the proposed advisory committee. The creation of another committee, would lessen the effectiveness of the existing

committees instead of providing additional useful advice and consultation. In our view, NOAA, NASA and the application agencies currently receive adequate input in the area of remote-sensing from the existing committees. We are able to receive, from the existing committees as well as from workshops and conferences, input on all the issues set forth in section 7. We therefore strongly request that section 7 be deleted from the bill.

Thank you for the opportunity to present this brief overview of the progress of Landsat commercialization and to comment on H.R. 4932. I would be happy to answer any questions which you might have.

Mr. NELSON. OK. Let me just wrap up here by asking you, in your prepared testimony, you talked about here that you're going to have this joint R&D report coming to the Congress. How did you address the needs of the commercial remote sensing private sector?

Dr. BISHOP. If you'll allow me a flip answer, I would like to say poorly.

We reached out to the private sector a little bit, to the users.

Mr. NELSON. How was that? How did you solicit their information?

Dr. BISHOP. Through conversations, through reports, and actually through the use of one report that we got from our colleague and friend Dr. Henderson of the Geosat Committee. We incorporated that into our thinking. We found in the course of preparing the document that we were more overwhelmed with putting together just the programs among the Federal agencies and getting us all to agree on what the joint program was that existed today that we didn't have the time or resources to do an adequate job of reaching out to the private sector users.

I have a personal commitment to see that in the next round, that that gets done far better. We didn't do an adequate job in the first round, and I think you're probably hearing that from other sources, and it's true.

Mr. TILFORD. Mr. Chairman.

Mr. NELSON. Yes, sir.

Mr. TILFORD. I believe we so state in the report that when we were initially putting the report together for the first review process, the commercialization aspects of Eosat and what was going to happen in terms of the Landsat commercialization had not been finalized.

So in putting together this report, we were not even sure that there was going to be a commercial entity. So it was extremely difficult to address the future not knowing what the present was in terms of a plan.

Dr. BISHOP. That's true. Considering the dates, it was late last summer when the draft was prepared, and it was at the same time that we were going through the final negotiations for a contract with Eosat.

So what Dr. Tilford says is quite true.

Mr. HENDERSON. Mr. Chairman.

Mr. NELSON. Yes, sir.

Mr. HENDERSON. If I may just make an outside comment, a concern that I hope you will consider, in my understanding, the preparation for the national unified plan, there has been—I don't know if there is in the current version, but there has been a considerable problem in how to write a plan that meets the requirements, short-term requirements, of OMB, and therefore I hope that somehow that is taken into consideration in evaluation of the plan and future plans, because a long-term plan should not be impeded by short-term budget constraints.

Mr. NELSON. That has been a real concern.

Let me wind up here by asking Mr. Williams, how would you implement the new section 603? What restrictions would you place on the duplication of data for buyers who want to do R&D?

Mr. WILLIAMS. Mr. Chairman, I think that's a question that probably requires a written answer and a little bit of thought rather than just an off-the-cuff answer at the table. If you will allow me, I would be happy to submit an answer to your detailed question in written form.

Mr. NELSON. OK.

[The answer follows:]

C.P. WILLIAMS President and Chief Operating Officer

August 5, 1986

The Honorable Bill Nelson
307 Cannon House Office Building
Independence Avenue
Washington, DC 20515

Dear Congressman Nelson:

During my oral testimony before the Space Science and Applications Subcommittee on July 18, 1986 concerning H.R. 4932 (now H.R. 5229), proposed amendments to the Land Remote Sensing Commercialization Act of 1984 (the "Act"), you asked me how EOSAT would implement the revised Section 603 of the Act. More specifically, you also asked what restrictions we would place on the duplication of data by buyers or grantees who want to use it for research and development purposes. In accordance with permission granted during my testimony, I am pleased to respond to these inquiries on behalf of EOSAT, and request that our response be included in the hearing record.

EOSAT supports the proposed amendment to Section 603 as it is currently included in the bill, and believes that no further modification is necessary in order to accommodate the concerns that have been expressed to the Subcommittee. We understand that the purpose of this amendment is simply to make it clear that Section 603 does not, and was not intended to, limit the manner in which a system operator may choose to protect its proprietary rights in unenhanced data. In particular, the revised language clarifies the original legislative intent that, in addition to requiring simply that the data "not be reproduced or disseminated by the purchaser," the system operator may impose "other terms and conditions" so long as they comply with Section 601 of the Act. Finally, the revised provision applies in all instances, whether the data are sold or are distributed by means other than sale such as a data grant made under the new Section 504.

A copy of EOSAT's "Agreement for Purchase and Protection of Satellite Data" (the "Data Agreement") is attached hereto. Because the Landsat Satellite Data are special, unique and valuable assets of the system operator, EOSAT has designed restrictions on reproduction and dissemination to preserve its right to assert trade secret protection with respect to the Landsat Satellite Data (see Section 2 of the Data Agreement). As Congress recognized in enacting Section 603, the system

Earth Observation Satellite Company
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operator's ability to protect its data against unauthorized reproduction or dissemination is essential to the commercial viability of land remote sensing. See S. Rep. 458, 98th Cong., 2d Sess. 31 (1984). (Furthermore, some states automatically declare restrictions on reproduction and distribution to be against public policy except when such restrictions are designed to protect a trade secret such as the Landsat Satellite Data.) At the same time, we wish to emphasize that the restrictions contained in the Data Agreement do not pose unnecessary or artificial barriers to any purchaser's or grantee's use of the Landsat Satellite Data, regardless of whether the user is a private commercial firm, a government agency, or a publicly or privately funded research and development program. On the contrary, EOSAT's business plan is to strive for the maximum utilization and dissemination of Landsat Satellite Data, restricted only to the extent necessary to assure its ability to protect the data, and enhance the longer term commercial viability of our business.

To this end, EOSAT has adopted a policy of granting waivers to the requirements of the Data Agreement in those instances in which such a waiver is necessary in order to accommodate the purchaser's (and now the grantee's) use of Landsat data for scientific, academic or community service purposes which require publication or other dissemination of such data. Such waivers have been granted on at least 42 occasions since EOSAT came into existence less than a year ago. In addition, EOSAT has adopted an interpretation of the term "affiliates" (as used in Section 2.c of the Data Agreement) which essentially allows the sharing of data by any two or more organizations which are collaborating on a joint project -- including joint scientific or research and development projects -- for purposes related to that project. We believe, therefore, that EOSAT has established a data protection framework that affords its users the maximum flexibility while at the same time preserving the minimum overall confidentiality which is essential to the commercialization effort.

EOSAT submits that the above considerations apply with equal validity, and that the purposes served by our Data Agreement are the same, whether the user is a commercial user, the government or a public or privately funded research and development user, and whether the data are sold (including data sales pursuant to Section 503) or are distributed in the form of a data grant. In each instance the confidentiality considerations -- including the minimum restrictions necessary to preserve the system operator's proprietary rights -- are the same. We therefore believe that Section 603 need not -- indeed, it must not -- differentiate between data used for R&D purposes and data used for other purposes, and that it should apply to R&D users in the same manner as to other users.

In stating this proposition, we wish to make two observations. First, the concerns expressed by NASA in its testimony before the subcommittee are not directed to the proposed amendment to Section 603, but rather are addressed to the wisdom of Section 603 itself. For the reasons set forth above, we submit that the policies underlying Section 603 are sound, and that the protection which it affords is essential to the commercialization process.

Second, EOSAT is very sensitive to the concerns expressed by NASA with respect to its research and development programs. EOSAT encourages and supports Landsat applications research efforts. Indeed, we are of the firm opinion that an effective R&D program within the remote sensing community is absolutely essential to the long term commercial success of our undertaking.

Nevertheless, we believe for the reasons stated above, including the liberal availability of waivers for publication of Landsat data and EOSAT's broad interpretation of the term "affiliates" to include all participants in joint projects, that the confidentiality restrictions contained in our Data Agreement and authorized by Section 603 will not impair in any way the ability of NASA, or of any other scientific or research organization, to pursue its research and development goals. Specifically, NASA's practice of utilizing multiple investigators to perform research funded by the same program within a given Federal agency would not be impeded or curtailed.

In answer to your inquiry, therefore, EOSAT submits that Section 603 of the Act properly applies to all Landsat users, including R&D users, in the same manner, and that no change in the wording of amended Section 603 (as set forth in H.R. 5229) is necessary.

EOSAT appreciates this opportunity to submit its views on this most important matter and would be pleased to provide any further information which you may find helpful.

Very truly yours,

C. P. Williams
President & Chief Operating Officer

bcc: G. Edwards
U. Hyman
E. Kahoe
C. Kupperman
J. Lynch
R. Mroczynski
P. M. P. Norris
[redacted]
S. Tilford

EXHIBIT 1

Agreement for Purchase and Protection of Satellite Data

EOSAT
Earth Observation Satellite Company

This Agreement covers sales by Earth Observation Satellite Company (EOSAT) to Purchaser of information sent to Earth by LANDSAT satellites (Satellite Data)

Section 1. **Purchaser's Orders**. Satellite Data may be ordered by Purchaser at the prices, payment and delivery terms established from time to time by EOSAT. Purchaser's orders shall specify the Satellite Data desired, and may be submitted on forms provided by EOSAT. Purchaser may also use its own forms, but such forms shall be used for convenience only, and any terms and conditions they contain are of no force or effect. EOSAT reserves any right it may have to accept or reject any order from Purchaser.

Section 2. **Confidentiality of Satellite Data**. Purchaser acknowledges that Satellite Data is a special, valuable and unique asset of EOSAT, and that Satelite Data is confidential information which is disclosed in confidence to Purchaser under this Agreement. With respect to each purchase made under this Agreement, so long as EOSAT retains rights to Satellite Data pursuant to federal law:

a. Purchaser agrees to use, translate, enhance or display the Satellite Data purchased hereby only for its own authorized purposes, which purposes shall be directly related to its established activities or lines of business.

b. Purchaser agrees not to reproduce or permit reproduction of Satellite Data. Enchancement of Satellite Data shall not be considered reproduction.

c. Purchaser agrees not to permit access to, disclose or otherwise make available any Satellite Data to any person for any purpose, except to Purchaser employees, affiliates, contractors and consultants for purposes directly related to Purchaser's authorized use of the Satellite Data, but not in any event to Purchaser's competitors.

d. Purchaser agrees to take appropriate action, by instruction, agreement or otherwise, with any persons permitted access to Satellite Data so as to enable Purchaser to satisfy its obligations under this Agreement, including appropriate security measures to prevent inadvertent disclosure.

e. Without limiting the generality of the foregoing, Purchaser agrees to abide by the limitations on the package warning and not to separate the package warning from the Satellite Data except as may be necessary to use the Satellite Data as contemplated hereby. A copy of EOSAT's Package Warning appears below.

Section 3. **Limited Warranty**. Unless otherwise indicated in a statement accompanying Satellite Data delivered hereunder, EOSAT warrants that the Satellite Data it provides will cover the area of the Earth and spectral bands specified in Purchaser's order, and will be radiometrically or geometrically corrected if requested in Purchaser's order. In addition, EOSAT warrants that the media used to carry the Data shall be free from defects in materials and workmanship under normal use for 90 days from the date of delivery to Purchaser. THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Section 4. **Limitation of Remedies**. If the Satellite Data is not as warranted by EOSAT in Section 3, upon return of such Data, EOSAT shall replace the Satellite Data or refund the purchase price paid therefor, at EOSATs option. Such replacement or refund shall be the Purchaser's exclusive remedy for any delivery or non-delivery of Satellite Data. EOSAT'S LIABILITY FOR DAMAGES TO THE PURCHASER FOR ANY CAUSE WHATSOEVER, AND REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT OR IN TORT AND WHETHER OR NOT EOSAT WAS NEGLIGENT, ACTIVELY OR PASSIVELY, SHALL IN NO EVENT EXCEED THE PURCHASE PRICE PAID BY THE PURCHASER FOR THE DEFECTIVE SATELLITE DATA. In no event will EOSAT be liable for any lost profits, lost savings or other consequential damages, even if EOSAT has been advised of the possibility of such damages.

Section 5. **Term**. This Agreement may be terminated with or without cause by either party upon written notice. However, this Agreement covers orders received and accepted prior to termination.

Section 6. **General**. This Agreement is the complete, final and exclusive statement of terms of the agreement between the parties, and supersedes all proposals, prior agreements and understandings between the parties relating to the subject matter of this Agreement. This Agreement cannot be modified or rescinded, nor may any of its terms be canceled or waived, except by a written instrument signed by both parties. Purchaser's rights and obligations under this Agreement are not assignable or transferrable without the prior written consent of EOSAT or its successor, and any attempt to assign or transfer such rights and obligations without such written consent is void. This Agreement shall be governed by Delaware law, and the parties subject themselves to the jurisdiction of the State and Federal Courts of Delaware with respect to any dispute or claim arising under it.

_____ Purchaser	Earth Observation Satellite Company
By _____ Authorized Signature	By _____ Authorized Signature
(Title) _____	(Title) _____
TYPE OR PRINT	
Name _____	Name _____
Company Name _____	TWX _____
Address _____	Tel No. _____

[redacted]

For questions regarding the above Agreement please call: 1 800 344-9933 or (301) 552-0500

Landsat Price List

PRICES SUBJECT TO CHANGE

All products are sold subject to EOSAT's Agreement for Purchase and Protection of Satellite Data ("Agreement") which prohibits the reproduction of EOSAT products. A copy of this Agreement is on the reverse side of this order form. If you have previously signed a copy of this Agreement you need not sign it again. However, no data will be shipped until there is a signed copy of the Agreement on file with EOSAT.

Standard Photographic Products

Black and White Products

NOMINAL IMAGE SIZE	APPROX.* SCALE	PRODUCT MATERIAL	PRODUCT CODE	PRICE $ MSS/RBV	PRICE $ TM
18.5cm (7.3 in.)	1:1,000,000	Film Negative	03	90	160
18.5cm (7.3 in.)	1:1,000,000	Film Positive	13	80	150
18.5cm (7.3 in.)	1:1,000,000	Paper	23	50	100
37.1cm (14.6 in.)	1:500,000	Paper	24	100	170
74.2cm (29.2 in.)	1:250,000	Paper	26	150	250

Color Composite Products

NOMINAL IMAGE SIZE	APPROX.* SCALE	PRODUCT MATERIAL	PRODUCT CODE	PRICE $ MSS	PRICE $ TM
18.5cm (7.3 in.)	1:1,000,000	Film Positive	53	150	360
18.5cm (7.3 in.)	1:1,000,000	Paper	63	100	300
37.1cm (14.6 in.)	1:500,000	Paper	64	200	400
74.2cm (29.2 in.)	1:250,000	Paper	66	350	500

Color Composite Generation †

PRODUCT CODE	PRICE $ MSS	PRICE $ TM
59	200	300

Customer must designate which band combination is desired by entering band selection in the "Color Combination" column on order form. All band combinations are produced in blue-green-red sequence. Cost of products produced from composite are in addition to generation fee.

* Excludes RBV. † Unless otherwise requested standard color composites will be generated as follows: Landsat 1, 2, 3 - MSS bands 4, 5, 7. Landsat 4,5 - MSS bands 1, 2, 4. TM bands 2, 3, 4.

Note: For custom orders or for priority service there is a surcharge.

Custom enlargements of photographic prints are available at a fee of $100.00 scene enlargement.

PRIORITY SERVICE: a 7 calendar day turnaround is available on your product order. This applies only to products made from existing color composite or black and white masters.

There will be a 3x fee.

Standard Digital Products *(Computer Compatible Tapes)*

TRACKS	BPI	FORMAT	MSS All Bands (band Sequential) CODE	MSS All Bands (band Sequential) PRICE $	MSS All Bands (band Interleaved) CODE	MSS All Bands (band Interleaved) PRICE $	RBV Single Subscene CODE	RBV Single Subscene PRICE $	Set Of Four RBV Subscenes CODE	Set Of Four RBV Subscenes PRICE $	TM Full Scene CODE	TM Full Scene PRICE $	TM Quarter Scene* CODE	TM Quarter Scene* PRICE $	Mss/tm CCT Copies † MSS CODE	Mss/tm CCT Copies † MSS PRICE $	Mss/tm CCT Copies † TM CODE	Mss/tm CCT Copies † TM PRICE $	TM ½ Scene Copies CODE	TM ½ Scene Copies PRICE $
9	1600	TAPE SET	184-A	660	184-B	660	184-C	660	184-D	1320	81	3300	83	1650	92	120	86	720	94	180
9	6250	TAPE SET	185-A	880	185-B	880	185-C	880	185-D	1320	80	3300	82	1650	93	60	90	240	95	80

CCT data formats and data acquisition dates: **MSS**: BIP-2 (CCT-X)—Prior to Jan. '79; BSQ or BIL (corrected only)—Jan. '79-May '81; BSQ or BIL (corrected or uncorrected)—June '81 to present; **RBV**: CCT not available prior to Sept. '80; SSQ (corrected only)—Sept. '80-May '81; SSQ (corrected or uncorrected)—June '81-March '83; **TM**: BSQ or BIL (corrected or uncorrected)—TIPS Apr. '84-present.

***TM CCT Quarter numbering scheme**

1	2
3	4

Customer must designate which TM CCT quarter scene is desired desired in CCT column on order form using (1,2,3,4).

†Additional copies:
Because of the trade secret agreement additional copies of MSS or TM CCT's (not more than 10 of same scene) may be purchased at the time of original order only.

Special Acquisition Surcharges* *(to schedule new scene acquisitions)*

(Product cost must be added to special acquisition surcharge)

	PER SCENE PRICE $
MSS Data Acquisition	460
TM Data Acquisition	1600
Cloud Cover (Guarantees images with 30% or less scene cloud cover)	275

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* Requires a minimum of 48 hours lead time. In general, notification at least 21 days in advance is preferred for scheduling TDRSS and other system components.

To request a Special Acquisition Please Call:

1 800 367-2801

or **(605) 594-6511**

TWX 910-668-0310

RELATED PRODUCTS

70mm Landsat MSS

For those customers who have additive color viewers and wish to composite and view Landsat MSS bands using this system, 70mm film positives and negatives are available. Please call for additional information.

	Product Code	Unit Price $
Film Positive	11	80
Film Negative	01	90

Sample CCT's (Computer Compatible Tapes)

A sample Landsat 4 MSS scene and a sample TM scene are available with ancillary materials. Please contact EOSAT customer services.

	Product Code	Unit Price $
MSS CCT	988	50
TM CCT	989	200

For shipments outside the U.S. *customer pays shipping and handling cost*. See current EOSAT shipping/handling chart.

Mr. NELSON. Does anybody have any further questions?

Any further statements from any of you?

Mr. WILLIAMS. No, thank you.

Mr. HENDERSON. Yes, I have one further statement, Mr. Chairman.

Mr. NELSON. Please.

Mr. HENDERSON. I was counting up and realizing that I had done this 17 times before on Landsat, and I also want to say that it's been a pleasure to be here and have an active series of questions asked. It's been most enjoyable and most informative, and I thank you.

Mr. NELSON. Well, it's our pleasure, and we thank you, and we hope that this system is going to get off dead center and moving, and it's our intent—it's the intent of Congress and, I can tell you, this committee and of the other committee—this, by the way, is a joint hearing of two subcommittees—that it's our intent that we want to see this capability for the United States, and so we want to encourage you, and that's what we're going to do from our perspective as one of the separate but equal branches of Government.

Thank you for joining us.

[Whereupon, at 12 noon, the subcommittee was adjourned.]

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